CALGARY RIVER VALLEYS PLAN

DEVELOPMENT OF POLICIES - DRAFT

SUPPORTING INFORMATION
TO
'THE PLAN AND POLICIES'

THE CITY OF CALGARY
PLANNING DEPARTMENT

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A LAND USE ANALYSIS

A1 SYNOPSIS

A1.1 The Bow River

A1.1.1 Land Uses:

A1.1.1.1 Cultural Features

The main cultural features along the Bow River are: parks (developed and semi-developed), residential development, industrial uses, golf courses, the Calgary Zoo, industrial and commercial establishments, transportation corridors, sewage treatment plants, agricultural uses, snow disposal sites, railway lines and utilities.

A1.1.1.2 Recreational Uses

The major recreational uses which are accommodated in public parks adjacent to the Bow River are hiking, bicycling, jogging, cross-country skiing, picnicking, organized day and overnight camping, amusement park facilities and court games. Canoeing, rafting, swimming, and fishing in the Bow River are also popular recreational activities.

A1.1.1.3 Non-Recreational Uses

A1.1.1.3.1 Residential Areas

The only areas of the city in which residential lots abut the watercourse are in the northwest along Bow Crescent and 48 Avenue N.W. in Bowness, adjacent to 52 Street N.W. in Montgomery, downstream of the Trans-Canada Bridge, and north of New Street S.E. in Inglewood.

Extensive areas of residential land are located adjacent to the Bow River, being separated from it by roads, community reserve lands or other areas of open space. The main residential areas are parts of Bowness, Montgomery, Bridgeland-Riverside, the Point McKay development, portions of the downtown residential community and the communities of Parkdale, West Hillhurst, Hillhurst/ Sunnyside, Crescent Heights and Inglewood.

There are several areas of residential development located at the top of the riverine escarpments which are immediately adjacent to the river. These are located in the communities of Silver Springs, Varsity, Wildwood, Spruce Cliff, Millican-Ogden and Queensland Downs.

On October 23, 1979, City Council approved Area Structure Plans for the Riverbend and McKenzie areas, for predominantly residential uses, on the east bank of the Bow River in the southeast sector of the city.

A1.1.1.3.2 Transportation Corridors

The river constitutes a formidable barrier to intra-city access and is crossed by many of the city's main roads. The major road crossings are the 85 Street Bridge N.W., Bowness Road (Shouldice Bridge), Trans-Canada Bridge, Crowchild Trail Bridge, 14 Street (Mewata) Bridge, 10 Street (Louise) Bridge, Centre Street Bridge, Edmonton Trail (Langevin) Bridges, Baine's Bridge, the 12 Street S.E. Bridge, the 17 Avenue S.E. (Cushing) Bridge, Bonnybrook Bridges, Deerfoot Trail, Glenmore Trail (Graves) Bridge, the proposed Deerfoot Trail, and the Highway 22 Bridge.

Major arterial thoroughfares parallel extensive portions of the river very close to the riverbank. Presently, these major routes include the Bow Trail in the eastern portion of Sunalta, the Deerfoot Trail in the vicinity of the W.I.D. canal, and the extensive Bowness Road/Parkdale Boulevard/Memorial Drive network which extends from Parkdale to Bridgeland-Riverside. These major roadways impinge on the riverside parklands and are aesthetically unpleasant with the exception of the tree-lined Memorial Drive which has a pleasant 'boulevard' appearance between 14 and 10A Streets N.W. and 10 and 5 Streets N.W.

The Deerfoot Trail extension will pass very close to the river in the southern portion of the Cominco Natural Area and will make two river crossings: at the 50 Avenue S.E. alignment, and by the southern portion of the Commac site. The first crossing has been completed.

A1.1.1.3.3 Railway Lines

The C.P.R. tracks cross the Bow River at the Twin Bridges, the 17 Street S.E. C.P.R. Bridge and the Bonnybrook Bridges. The C.N.R. tracks cross the river at approximately the 55 Avenue S.E. alignment. The C.P.R. tracks and their embankment parallel the river very close to the riverbank between the Trans-Canada Bridge and the western boundary of Edworthy Park, between the eastern boundary of Edworthy Park and the western boundary of Lowery Gardens and between the eastern boundary of Lowery Gardens and the Crowchild Trail Bridge.

There is an extensive area of sidings located adjacent to the river north of the Bonnybrook Bridges and a branch line to the Gulf Oil refinery which passes adjacent to the river south of the Inglewood Bird Sanctuary connecting with the above sidings. In accordance with existing policy of City Council (June 1974, Appendix II), these uses are incompatible with riverside land in an urban environment.

A1.1.1.3.4 Commercial and Institutional Uses

There are numerous, scattered commercial and institutional uses located close to the river particularly in the downtown area, in the southeast portion of Bowness and in the communities on the left bank of the Bow River between Montgomery and Albert Park-Radisson Heights.

The only major commercial uses located very close to the river are the two large car dealerships in Sunalta and the City bus barns in the downtown area. The bus barns will be relocated to a site west of the Elbow River and north of 12 Avenue S.E.

A1.1.1.3.5 Industrial Uses

There are a large number of industrial sites located both in the vicinity of and immediately adjacent to the Bow River. The major industrial operations are: Klippert Concrete Ltd., Con Force Products, Russelsteel, Gulf Oil, Consolidated Concrete (two locations), Supercrete, (Stoy Concrete), Cominco, Burnco, Commac, and Canadian Industries Ltd. (C.I.L.). All the industrial sites are aesthetically unpleasant particularly in the southeast portion of the city where there is extensive primary industrial extraction of gravel and in many localities both vegetation and topsoil have been stripped to the riverside. Although these uses are incompatible with the riverside land in an urban setting, there are no other sites located suitably close to the city where gravel may be extracted and hauled economically to places where it is needed.

A1.1.1.3.6 Sewage Treatment Plants

There are two City sewage treatment plants (secondary facilities) located in the southeast portion of the city at Bonnybrook and at Fish Creek. The Bonnybrook Plant, which is currently being upgraded, is partially screened from the river by the riverine flatlands south of the Bonnybrook Bridges and by a line of tall shrubs and mixed poplars on the riverbank to the south of this area. The Fish Creek Plant is located about 800 ft. (240 m) from the river and has recently undergone a major expansion.

A1.1.2 Ownership:

In the study area, the Bow River is approximately 28 miles (44.8 km) in length. About 29.5% (8.27 miles/13.23 km) of the right riverbank land and 42.5% (11.89 miles/19.02 km) of the left riverbank land along the river is privately owned. The remainder of the 70.5% (19.73 miles/31.57 km) and 57.5% (16.11 miles/25.78 km) of the right and left riverbanks respectively are owned by the Province and the City. Generally, the public land adjacent to the river consists of designated and dedicated parkland and other City-owned land including institutional development. The privately held lands are developed for residential, industrial and commercial purposes. The remaining land in private ownership is either vacant or used for agricultural purposes. For more detailed information regarding riverbank land ownership reference should be made to Section A2 of the 'Land Use Inventory and Analysis' part of this report.

A1.1.3 Public Access:

Along the right banks of the river adjacent to the residential communities of Bowness and Montgomery, the riverbank land is in private ownership. However, there is restricted public access to and, in certain cases, along the riverbanks abutting these communities although this access is not continuous along the riverbank. Along the left bank opposite to Bowness, public access to and along the river is permitted via public parkland and an easement through the private land owned by Klippert Concrete. It should be noted that the walkway/pathway existing in this area comes to a dead end in the vicinity of another privately-owned property to the west (Fournier Property). Therefore, the aforementioned walkway/pathway does not provide a linkage between Bowmont Park and Bowness Park west of 85 Street N.W.

Between Shouldice Athletic Park and the Calgary Zoo there is continuous public access along both banks of the Bow River. The above section of the existing walkway/pathway system is intensively used by joggers, cyclists, pedestrians and cross-country skiers. Excepting Edworthy Park, Wildwood, Spruce Cliff and the downtown area between 14 Street S.W. and Fort Calgary, the current walkway/pathway system does not, however, allow 'free' pedestrian access from the remaining communities adjacent to the Bow River. This is due to the presence of major transportation corridors between the Bow River and the adjacent residential communities, e.g. Bow Trail and Memorial Drive.

The current walkways/pathways allow passive recreational activities such as sitting on the benches located adjacent to the walkways/pathways for enjoyment of the riverine environment.

Along the southeast reach of the river, apart from the publicly owned lands, no access to the river is available. However, access to the Bow River valley is possible because of the large undeveloped parcels of land existing adjacent to the watercourse. Although access through private undeveloped parcels of land is possible, such access is not legalized.

A1.1.4 Development in the Floodplain:

With exceptions such as Bowness Park, Bowmont Park, Shouldice Athletic Park, Edworthy Park, Lowery Gardens, Prince's Island, William Pearce Estate and the Inglewood Golf Course, the floodplain along the upper reach of the Bow River has been intensively developed primarily for residential and vehicular traffic use with some commercial and industrial development. It should be noted that there are five single-family lots with homes north of Bowbank Crescent N.W. in Bowness which are located entirely within the floodway limits. Two of these properties have been purchased by the City of Calgary.

Along the lower reach of the Bow River between the Bonnybrook Bridges and Fish Creek, the floodplain is used mainly for gravel mining operations and agricultural activities. Little development of a structural nature has occurred along the lower reach and the floodplain is mostly designated as Direct Control District, Agricultural and Open Space District and Urban Reserve District.

Recent examples of comprehensive development in the floodplain include the Point McKay and the Deer Run developments. These developments were permitted subject to the current Floodplain Management Policy of City Council (June, 1974). Since 1973, considerable residential development has occurred in the floodplain of the Bow River without having to comply with the aforementioned policy. Based on the amount of development that has taken place in the floodplain during the past eight years, the rate of development clearly indicates an upward trend which can be related to the overall rapid growth of the city.

A1.1.5 Aesthetics:

Throughout the Bow River corridor the landscape is visible to varying degrees from the adjacent land and the river itself. Along the entire length of the river, there are certain locations which offer excellent views of the city skyline and the river. These viewpoints are identified on the land use concept plans. Opportunities offered by the Bow River for recreational driving are very restricted. Although a substantial amount of development has taken place in the floodplain, an overall impression of 'openness' and 'naturalness' is still evident in the upper and lower reaches of the Bow River. Most of the existing industrial uses are incompatible with the riverside land in an urban setting.

A1.1.6 Tourist Attractions:

Along the Bow River corridor the major tourist attractions are: Bowness Park, Edworthy Park, Prince's Island, downtown Calgary, the Zoo islands (St. Patrick's and St. George's Islands), the Sam Livingston Fish Hatchery, the William Pearce Estate, the Inglewood Bird Sanctuary, and Fort Calgary located at the confluence of the Bow and Elbow Rivers.

A1.1.7 Utilities:

All discharges along the Bow River are licensed by the Alberta Department of the Environment. The industries which are presently licensed to discharge into the Bow River are: Gulf Oil of Canada Ltd., Firestone Canada Ltd., the Bonnybrook Sewage Treatment Plant, Burnco Industries Ltd., Cominco, C.I.L., and the Fish Creek Sewage Treatment Plant. Additionally, there are several overhead power and telephone lines as well as buried cables adjacent to and across the Bow River and numerous storm sewers which empty into the river.

A1.2 The Elbow River

A1.2.1 Land Uses:

A1.2.1.1 Cultural Features

The major cultural features along the Elbow River are: a water purification plant, an electric transformer station, parks (developed and semi-developed), a golf course (Calgary Golf and Country Club - private facility), residential land uses, a hospital, a cemetery, the Stampede Exhibition Grounds, Fort Calgary, industrial and commercial land uses and transportation corridors.

A1.2.1.2 Recreational Uses

There are five major established parks located along the Elbow River, namely: Glenmore Athletic Park, Sandy Beach/River Park, Stanley Park and Lindsay Park. Some of the main recreational facilities which are provided in these public parks are: hiking trails, bicycle paths, swimming pools, picnic areas, tennis courts, ice hockey and skating rinks, field hockey, football and soccer fields. Elbow Island Park is also a major public park but it is not developed to the same extent as the above mentioned parks. In addition, there are a few linear riverbank strips of parkland along the river for active and passive recreational purposes. Canoeing, fishing and, to a certain extent, swimming are the main water-based recreational activities. Skating and cross-country skiing in winter are also possible. The moderately steep banks of the Elbow River and the adjacent privately owned developed areas limit recreational use of the river. However, it should be noted that the Elbow River has limited regional recreational resource capacity because of its small size and low water flow levels.

A1.2.1.3 Non-Recreational Uses

A1.2.1.3.1 Residential Uses

With respect to the existing residential development adjacent to the Elbow River, it must be emphasized that this development, approximately 2.5 miles (4 km) abutting the right bank and 2.1 miles (3.36 km) adjacent to the left bank, comes quite close to the river and, therefore, in almost all cases, is entirely within the floodplain limits based on a designated flood of 20,300 c.f.s. with a return period of one in 100 years, ("Elbow River Flood Study", December 1979, Monenco Consultants Ltd.). The majority of existing development is single-family residential. However, there are some apartment buildings and a few institutional and industrial establishments adjacent to the river.

A1.2.1.3.2 General Storage

Stampede Grounds land, which is currently leased by the City of Calgary to the Calgary Exhibition and Stampede Board, has a strong influence upon the use of its immediately adjacent riverside areas. It appears that the Stampede Park Association has, to date, not taken advantage of its attractive riverbank frontage. Adjacent to the river, the main facilities are storage and service yards which have a negative impact on the surrounding river valley open spaces. Storage yards generally reflect the appearance of ignored industrial development. These unsightly yards contain large barren areas, ghastly utilitarian structures, abandoned trucks and other scrap. Due to this situation the value of open spaces in the river valley may not be fully appreciated by the general public. The aforementioned uses are not compatible with the riverside land in an urban setting in accordance with the current Floodplain Management Policy of City Council.

A1.2.1.3.3 Transportation Corridors

There are major roadways which impinge upon the riverbank park system especially at 1 Street S.E., 2 Street S.E., 25 Avenue S.E. in the vicinity of Lindsay Park, and Elbow Drive between 4 Street S.W. and 29 Avenue S.W. In addition, other such roadways are planned to cross the riverbank park system particularly in the easterly portion of Lindsay Park, e.g. Macleod Trail and 26 Avenue connector.

At this stage, major crossings over the Elbow River include vehicular and pedestrian bridges. Recently, light rail transit bridges and a Stampede Grounds access bridge east of Macleod Trail (2 Street S.E.) were completed. Major transportation corridors crossing the river are: Mission Road, Elbow Drive, 25 Avenue S.W., 1 Street S.E. and 2 Street S.E., MacDonald Avenue, a C.P.R. line and 9 Avenue S.E.

Under the long range transportation plans, a bridge is proposed to be constructed at the 50 Avenue S.W. alignment crossing the Elbow River. For further information regarding the exact timing for the construction of the bridge, the City Transportation Department should be contacted. The existing developments immediately adjacent to the Elbow River restrict opportunities for recreational driving along the river.

A1.2.1.3.4 Industrial Uses

It is noted that light industrial uses are prevalent to the southwest and southeast of the Stampede Grounds, directly south of the C.P.R. line and east of the Elbow River. Furthermore, there is a City water purification plant and an electric transformer station located in the southern parts of Glenmore Athletic Park. The Sunbeam Bread Factory located directly west of 6 Street S.E. and south of 14 Avenue S.E., and a service station by the C.P.R. line come rather close to the Elbow River. At this location there are some mobile homes stored. A few of these are too close to the adjacent riverbank.

A1.2.2 Ownership:

The Elbow River between Glenmore Dam and its confluence with the Bow River is about 7 miles (11.2 km) in length. Approximately 40% (2.8 miles/4.48 km) of the right riverbank land and 34% (2.38 miles/3.81 km) of the left riverbank land along the river is privately owned. The remaining 60% (4.2 miles/6.72 km) and 66% (4.62 miles/

7.39 km) of the right and left riverbanks, respectively, are publicly owned. The public land is of three categories, namely: designated parkland, dedicated parkland and other City-owned land. For more detailed information regarding riverbank land ownership reference should be made to Section A2 of the 'Land Use Inventory and Analysis'.

A1.2.3 Public Access:

In the case of privately owned riverbank land, public access to or along the riverbanks is available only where easements have been granted by the adjacent land owners. Along the entire length of the Elbow River, within the study area, public access is permitted via public parks, road allowances, walkway/pathway rights-of-way or easements. Excellent visual access to both riverbanks is possible only when canoeing or cross-country skiing along the edge of the river. The existing walkway/pathway system adjacent to the Elbow River is continuous (not necessarily along both riverbanks). Recognizing its small size and limited recreational resource capacity at the regional level, public access to the Elbow River is currently adequate.

Wherever there is access to the river valley in the form of walkways/pathways, roadways or publicly owned open space, the river corridor is intensively used by the general public for both active and passive recreational activities.

A1.2.4 Development in the Floodplain:

Excepting the privately owned Calgary Golf and Country Club and public parks, the floodplain along the entire length of the Elbow River has been extensively developed, primarily for residential uses. Although new development and redevelopment involving single-family and multiple-family housing is still occurring in the floodplain, the rate of development is relatively slow.

A1.2.5 Aesthetics:

Along the entire reach of the Elbow River the landscape is visible to differing degrees from the land and the water. However, there are certain locations which offer excellent views of the river and city skyline. These viewpoints include the top of the riverbank land east of the river and immediately southwest of the Calgary Golf and Country Club golf course, the northeast corner of River Park, the Britannia Slopes, and Scotsman's Hill. The size of the valley and the nature of surrounding land uses creates an intimacy of scale. Natural areas exist, particularly along the riverbanks, but are generally small and discontinuous.

In the case of communities located immediately adjacent to the river and separated by a public roadway, good visual access to the river corridor is possible and one can appreciate the beauty of the Elbow River corridor landscape with its pleasant riverine environment.

A1.2.6 Tourist Attractions:

Within the study area, the Stampede Grounds and Fort Calgary are the only major tourist attractions.

A1.2.7 Utilities:

Currently, there are several overhead power lines and underground electric and telephone cables running along the riverbanks and across the river. In some cases, there are easement rights-of-way along the banks protecting the

above utilities. Approximately 75 storm sewers empty into the Elbow River below Glenmore Reservoir.

A1.3 Nose Creek: A - 80 Avenue N.E. To The Current City Limits

A1.3.1 Land Use and Ownership:

This general area was annexed to the City of Calgary in January of 1979. Currently, the land adjacent to Nose Creek consists of Crown land, farmland and land held by private development corporations. Crown land constitutes only a small fraction of all land adjacent to the creek. Most of the land adjacent to the creek is undeveloped with some farms within the plan boundaries. Additionally, there are three discontinued gravel extraction pits located east of Nose Creek in Section 26N.

A1.3.2 Public Access:

Public access to the creek is possible only where road allowances cross this watercourse within the study area. As the adjacent lands are mostly undeveloped, access to the creek valley is possible through private lands which are not fenced; however, the access is not legalized.

A1.3.3 Transportation Corridors:

Deerfoot Trail approximately parallels the course of the stream to the 96 Avenue N.E. alignment where it crosses the eastern escarpment and moves away from the creek. The creek is crossed by two roads in the study area, the Beddington-Delacour Road (112 Avenue N.E.) and 15 Street N.E. immediately south of the northern city limits.

The proposed Beddington Trail (Expressway) is planned to cross the C.P.R. line and the creek to join Deerfoot Trail just north of the 80 Avenue N.E. alignment. The C.P.R. line parallels the direction of the creek at a distance of 50 feet (15 m) to 1400 feet (425 m). For the most part the C.P.R. line is situated at the base of the western escarpment.

A1.3.4 Utilities:

There are four oil well sites and two gas lines in this general area. One gas line runs in a northwesterly direction crossing the creek just south of the 128 Avenue alignment. The other gas line crosses the creek about 900 feet (275 m) north of the confluence of Nose and West Nose Creeks. An overhead power line parallels 112 Avenue N.E. crossing the creek north of the 112 Avenue N.E. bridge.

A1.4 Nose Creek: B - 80 Avenue N.E. To The Bow River

A1.4.1 Land Use and Ownership:

The land ownership pattern within the Nose Creek valley is dominated by publicly owned lands. Approximately 20% of the total 1976 "Nose Creek Concept Plan" area is allocated for transportation rights-of-way; 56% of the land is City-owned land which is mostly designated as Agricultural and Open Space, Urban Reserve and General Light Industrial Districts. City-owned residential land is slightly more than privately owned land in the same category. The amount of City-owned industrial land has been reduced as a result of the recently created parkland immediately adjacent to the creek. The remaining 24% of the land is privately owned and it is mostly designated as Agricultural and Open Space District, General Light Industrial District and Highway Commercial District.

The present recreational space includes golf courses, playing fields and regional open space along the creek. During winter, recreational activities such as skating, tobogganing and cross-country skiing take place in this area. According to the amended "Nose Creek Concept Plan", approved by City Council on July 23, 1979, the open space proposed for recreational purposes will be increased when the City has purchased all the privately owned parcels of land adjacent to the creek. It is also anticipated that the existing Zoo facilities will be expanded north of Memorial Drive and west of Nose Creek south of Centre Avenue. Currently, an expansion of the Zoo facilities is taking place south of Memorial Drive and immediately west of the main entrance to the Zoo.

In the vicinity of McKnight Boulevard, the existing industrial development is aesthetically unpleasant. Recently, new industrial development has taken place east of Deerfoot Trail north and south of 64 Avenue N.E. and subdivision for industrial/commercial development has been approved west of Nose Creek and south of 8 Avenue N.E. However, no further major industrial development is anticipated immediately adjacent to the creek between 80 Avenue and the Bow River. At the public meetings held in 1978 and 1979, citizens expressed concerns about too much industrial development occurring in the Nose Creek valley. According to citizens, this type of development is polluting Nose Creek and makes pedestrian access to the valley very difficult. Therefore, future industrial development must be carefully reviewed before it is permitted in the Nose Creek valley.

A1.4.2 Public Access:

Generally, public access to the creek from the east between the Bow River and 80 Avenue N.E. is restricted due to the presence of the C.P.R. line and Deerfoot Trail. Public access to and along the west side of the creek is reasonably good. Public access to and along the creek will be improved when the amended "Nose Creek Concept Plan" is implemented.

A1.4.3 Transportation Corridors:

Deerfoot Trail and sections of Memorial Drive, 16 Avenue N.E., 32 Avenue N.E., 48 Avenue N.E. and 64 Avenue N.E. occupy considerable amounts of land in the study area. Deerfoot Trail and the C.P.R. line approximately parallel the course of the stream and the remaining aforementioned major roadways cross the creek in east-west directions. In addition, there are local roadways which provide vehicular access to the valley and to the industrial/commercial establishments existing in the valley.

A1.4.4 Utilities:

Utilities include power lines, telephone lines, gas lines, water mains, storm and sanitary sewers. Currently, there are 38 storm sewers outletting into this part of Nose Creek.

A1.5 West Nose Creek

A1.5.1 Land Use and Ownership:

The area north of 80 Avenue N.E. was annexed to the City of Calgary in January, 1979. The land ownership pattern is dominated by privately owned land which is currently undeveloped. There is some land which is used for farming and some residential development has taken place east and

west of 4 Street N.W. south of the creek. The City of Calgary Planning Department has engaged a private consultant to prepare an Area Structure Plan (predominantly residential with limited industrial development) for the general area north of the creek and west of the Deerfoot Trail within the current city limits. The "Calgary North Policy Report" was approved by City Council on July 22, 1980. It is estimated that some initial development in this area will take place in 1981.

A1.5.2 Public Access:

The Circle Eight Speedway is located beyond the top of the south-facing escarpment, about 350 ft. (105 m) north of the creek. Apart from where road allowances cross the creek, there is no public access to or along the creek in the entire study area. At this stage, access to the creek via private lands is possible because most of the adjacent lands are undeveloped and there are no fences; however, access is not legalized.

A1.5.3 Transportation Corridors:

Currently, the Beddington Trail (Expressway) is being designed and it will connect with Deerfoot Trail just north of 80 Avenue N.E. alignment. The expressway will parallel the creek westwards and will eventually connect with the proposed North West Bypass (Stoney Trail) and with the future extensions of John Laurie Boulevard, Shaganappi Trail and Sarcee Trail.

A1.5.4 Utilities:

An overhead power line crosses the creek at the 112 Avenue N.W. alignment. A gas pipeline follows the 6 Street N.E. alignment. Approximately 800 feet (244 m) north of the confluence of West Nose and Nose Creeks it changes direction to the west, crossing the creek a number of times and passing through the Simon's Valley Road and 4 Street N.W. intersection.

A storm sewer serves the residential development located east and west of 4 Street N.W. south of the creek, outletting into the creek adjacent to 4 Street N.W.

A1.5.5 Aesthetics of the Nose and West Nose Creek Valleys:

The valleys themselves are of visual interest but offer restricted opportunities for recreational driving because West Nose Creek is flanked by Simon's Valley Road and Deerfoot Trail runs through the Nose Creek valley, permitting only high speed driving.

In the case of West Nose Creek west of 4 Street N.W., the steep south-facing escarpment is the dominant visual feature. From the top of this escarpment, north of 112 Avenue N.W. by the city limits, there are excellent views to the west, south and east. With respect to Nose Creek, the existing well-defined escarpments on both sides offer a panoramic view of the entire valley and the city skyline to the south.

However, it must be emphasized that due to neglect and the general lack of landscaping, the existing industrial development adjacent to McKnight Boulevard is aesthetically offensive and imposes a negative impact on the potential aesthetic qualities of the Nose Creek valley. Additionally, there are areas in the vicinity of the Elk's Golf Course Club which are disturbed. Generally, neglect and littering are serious problems in the Nose and West Nose Creek valleys.

A2 IDENTIFICATION OF PROBLEMS AND OPPORTUNITIES

In the following sections major problems are noted along with certain opportunities which presently exist for the enhancement of the river/creek corridors. This chapter outlines the factors involved in achieving the overall plan objectives.

The realization of the recreational potential of the river/creek valleys is one of the primary objectives of this plan. Since a wide range of issues relate to this objective and because the situation varies between the Bow and Elbow Rivers, Nose and West Nose Creeks, the following discussion is divided into two main sections: water-based recreation and land-based recreation.

A2.1 The Bow River

A2.1.1 Water-Based Recreation:

A2.1.1.1 Canoeing/Boating/Rafting, Paddling, Fishing, Swimming, Skating:

The use of non-powered boats (e.g. canoes, rafts) and fishing are the predominant recreational activities on the Bow River. As it is hazardous to swim in the Bow River, swimming as a recreational activity does not occur. However, the existing lagoon south of Bowness Park is often utilized for swimming by the general public. The lagoon is extensively used for paddling, canoeing, and boating in the summer and for skating in the winter. Currently, this is the only lagoon adjacent to the Bow River where the aforementioned recreational activities can be enjoyed by all age groups. With respect to recreational skating activities it should be noted that the lagoon becomes crowded on weekends in the winter. This facility is presently under the management of the City Parks/Recreation Department. The Department recently engaged a private consulting firm to assess the demand and capacity of the existing recreational facilities within Bowness Park. The study has been completed and the Parks/Recreation Department may be contacted for further details.

There is another artificial lagoon located east of the Bow River directly south of Glenmore Trail S.E. Originally it was created for the storage of stormwater then subsequently leased to the Buoy Busters Club for testing their model sailboats. According to the Riverbend Area Structure Plan, approved by City Council on October 23, 1979, the existing lagoon will be dedicated as Environmental Reserve. As a result of subdivision, the lagoon area has become public and is under the jurisdiction of the City Parks/Recreation Department insofar as management and maintenance responsibilities are concerned. In accordance with The Planning Act, 1977, Environmental Reserve land must be retained in its natural state or utilized as a public park (Section 107(1)). When the Riverbend residential area east of the lagoon is developed, possible uses of the lagoon may include swimming, sailing, testing model sailboats, canoeing, paddling and skating.

Boating on the Bow River takes the form of canoeing. Within the city limits there are two major reaches frequently utilized by canoeists - from the Bearspaw Dam to the William Pearce Estate and from this estate to Fish Creek. Within these reaches of the Bow River, although there are no special canoe launching facilities, canoes can be put in and taken out adjacent to any of the existing public parks along the river. However, in order

to minimize damage to natural areas and wildlife habitats, it is important that canoe launching points be provided only at appropriate locations along the Bow River.

According to the Bow Waters Canoe Club, there is a need for whitewater training courses in the city. The Canoe Club has indicated that there is potential for two whitewater training courses on the Bow River: Louise Bridge (10 Street N.W.) to the Pearce Estate and from a point immediately south of an island downstream from the Pearce Estate to the south end of Inglewood Golf Course and then to the Canoe Club located on the north bank of the W.I.D. canal. A conceptual proposal for a whitewater canoe launching facility southeast of the Pearce Estate has been presented by the club to the Calgary River Management Advisory Committee. The Bow Waters Canoe Club was advised to consult with the Alberta Recreation and Parks Department in order to determine the feasibility of such a project.

It is further noted that there are no marinas or canoe clubhouses to service private and public canoes/boats on the Bow River between Bearspaw Dam and Fish Creek. In accordance with the information received by the Calgary River Management Citizens' Group from the Alberta Canoe Association, there is a need for a canoe launching facility adjacent to a suitable body of water in northwest Calgary. An example of this type of facility is the Al Azhar lagoon across the Bow River from Bowness Park. This private facility is made available to various interest groups.

In order to strengthen and further promote awareness of the Bow River adjacent to the downtown area, it is necessary to integrate land uses adjacent to the river with the "Proposed Inner City Plan" (1978) and the "Proposed Downtown Plan" (1979). Water-oriented recreational facilities such as a linear public riverbank park with appropriate locations for watching and enjoying wildlife and their habitats, walkways/pathways, a water fountain, paddling in the lagoon abutting the southern edge of Prince's Island, canoe launching points and skating may be considered. It is important that these facilities are planned in relation to the new development or redevelopment occurring in the downtown area. Such an action will benefit the downtown area and allow the Bow River to play a major role in the enhancement of the city's urban environment.

There are large undeveloped areas adjacent to the Bow River between Glenmore Trail S.E. and Fish Creek. In this section of the river there are gravel mining operations. Some of these gravel pits are sufficiently deep to facilitate the construction of lagoons and lakes for boating, swimming and skating. Therefore, when the gravel mining operations cease, there will be an opportunity for developing certain gravel pits according to future recreational needs. On the other hand, canoeing is a popular recreational activity in the southeast part of the city. Since there are no specific canoe launching points, it will be appropriate to provide these facilities at suitable locations along the Bow River in relation to the future development in this general area.

A2.1.1.2 Fishing:

The following information relates to fishing on the Bow River. For more detailed information reference should be made to Appendix VI, "Sport Fisheries Within the City of Calgary."

The following information pertaining to the Bow River fisheries has been provided by W.E. Griffiths of the Alberta Department of Energy and Natural Resources:

> "The Bow River is considered one of the finest rivers for sports fishing in Alberta. The excellent quality of fishing in terms of numbers and size of fish and its geographical location near a large urban centre makes the Bow River a premium area for recreational fishing. Mountain Whitefish is the most abundant sports fish while Rainbow Trout is the most sought after species in that portion of the Bow River below Bearspaw Dam. Brown Trout are also resident throughout the Bow River and contribute to the sports fishery. Eastern Brook Trout, Dolly Varden, Burbot and Northern Pike are occasionally caught downstream of the Bearspaw Dam. Various species of suckers and minnows are abundant throughout."

Bearspaw Dam to W.I.D. Weir:

The Bearspaw Dam regulates the flow discharge which is beneficial to the fisheries. Due to the lack of a fish ladder the Bearspaw Dam acts as a barrier to upstream movements of fish. According to the Alberta Department of the Environment, the water quality in this section of the river is acceptable in terms of primary (body) contact recreation; therefore, the impact on fisheries is low. There is good access to the river except for a small section along the south bank downstream from the Bearspaw Dam.

W.I.D. Weir to Fish Creek:

The following information has been received from the Alberta Department of the Environment.

The City of Calgary releases its sewage effluent into the river at Bonnybrook, imparting to the river approximately 10,582 pounds (4,810 kg) of biochemical oxygen demand (B.O.D.) per day. The resulting nutrient enrichment accelerates growth rates of the fish and increases the growth of aquatic vegetation. The Fish Creek Sewage Treatement Plant adjacent to the Bow River just upstream from the mouth of Fish Creek further enriches the river with a daily loading of 6,072 pounds (2,760 kg) of B.O.D. The water quality in this section of the river is very poor.

The consequent poor quality of water in the river is detrimental to fish production during low water periods. Extensive weed growth reduces trout spawning potential in the river. Side channel rearing areas are almost totally clogged with weed or filamentous algae. Production of trout in those channels is negated by low water flow levels, high water temperatures and low oxygen levels.

From late August to early October angling is also negatively impacted by the nuisance growths of rooted aquatic plants. Sports fishing and boating are extremely difficult at this time of the year below the City of Calgary because of drifting weeds. The weeds begin to die in late summer and drift in large pads or as scattered individual filaments throughout the water column.

Fishermen access to this section of the Bow River is good, and fishing from boats is common. A fish ladder at the W.I.D. Weir permits Mountain Whitefish and Brown Trout to gain access to the preferred upstream habitat sites.

It should be noted that the use of the Bow River for sports fishing is rapidly increasing as the city expands. Because the Bow River is easily accessible to residents in the Calgary region, pressure on the fishing resource is expected to increase very rapidly in the near future. It must be emphasized that the Bow River is a major recreational resource for Calgarians and for the Province of Alberta.

A2.1.2 Land-Based Recreation:

The rivers and valleys in the City of Calgary originally attracted the native people and, later, the early settlers to this area. Water has always been very significant in an aesthetic as well as a recreational sense to Calgarians.

A2.1.2.1 Bowness Park to Inglewood Golf Course:

The present land-based recreational resource features adjacent to the Bow River are: public parks, athletic parks, public and private golf courses, walkways/pathways, equestrian trails, the Calgary Zoo, Fort Calgary interpretive centre, the Inglewood Bird Sanctuary, and privately and publicly owned natural areas. These recreational resource features provide diversified recreational opportunities ranging from active organized sports to individual, contemplative activities. Specifically, these uses include picnicking, golfing, tobogganning, walking, jogging, cycling, swimming, skating, cross-country skiing, tennis, football, soccer, baseball, volleyball, adventure playgrounds, ice hockey, field hockey, visiting the Zoo, biological and zoological gardens, and cultural/historical parks.

Each of the existing recreational nodes may have a specific dominant characteristic yet they all complement each other in facilitating year round recreational activities within the river corridor. However, it is noted that some of the major recreation nodes do not have access links in the form of public open space, dirt trails or actually constructed walkways/pathways. This is due to the existence of private land located between these major recreational nodes. The private ownership of these lands includes vacant areas and the present residential communities of Bowness and Inglewood abutting the right bank of the Bow River.

The following table shows the percentage distribution of various public open space recreational land uses and other private land uses occupying the riverbanks between Bowness Park and Inglewood Golf Course (approximately 13 miles/20.8 km).

Public Open Space Recreational Uses (e.g. parks, golf courses)	City-owned: Leased Land (Inglewood Golf Course)	Industrial/ Commercial/ Institutional	Residential (Single-family & Multi-family)	Provincial Government Open Space
42%	7%	6%	20%	25%

It is noted that major portions of the privately owned large parcels adjacent to the right bank of the Bow River between Edworthy Park and the Trans Canada Highway west are undeveloped. Therefore, at the time of development, an opportunity will exist to negotiate for the provision of open space for public use adjacent to the river. This will also provide a necessary linkage between Edworthy Park and Shouldice Athletic Park via the Trans Canada Highway Bridge. Moreover, an opportunity exists to provide harmonious and diversified uses as a part of future development on these vacant lands along the Bow River.

Bowness Park, located north of 48 Avenue N.W. and west of 85 Street N.W., allows multiple recreational uses but is overcrowded during the summer and winter months. The City Parks/Recreation Department has engaged a consultant to assess the recreational capacity of this park and to recommend possible changes to meet the present and future demand for recreation. The consultant has also prepared alternative master plans for Bowmont Park which include recommendations regarding possible recreational uses in this major park which is presently undeveloped. At the public meetings arranged by the Parks/Recreation Department, citizens supported those alternative proposals which call for the retention of major parts of the park in their natural state. It should be noted that this regional park has a good recreation potential with respect to its size, topography, vegetation, and location. So far, no decision has been made regarding the proposed "master plan".

With respect to the overall urban environment, the downtown riverside area is one of the most significant parts of the Bow River. Because of its suitable location in relation to the city core area and its proximity to Prince's Island, it has a strong potential for various types of recreational activities. Presently, it is a focal point for mainly passive recreational uses since the area has not been developed for any specific use. However, there is a walkway/pathway running parallel to the southern edge of the lagoon adjacent to Prince's Island.

City Council has recently approved major developments in the downtown area. One example of the foregoing is the Eau Claire Development. As a result, public open space adjacent to and along certain parts of the lagoon adjacent to the southern edge Prince's Island has been created. Since the space is still vacant, there is an opportunity to utilize this space in such a manner that the lagoon frontage becomes a major point of attraction for the enjoyment and benefit of tourists and the people living or working in the downtown area. Future open space uses should be compatible with the water-based recreational activities which are possible on the river (e.g. canoe launching points ---> canoeing). The overall use of the riverbank land must be integrated with new development and redevelopment with the objective of achieving harmonious and diverse land uses along the river. In developing these areas, the existing distinctive characteristics of the riverine environment (e.g. riverbank slope, vegetation and wildlife habitat areas) should be maintained and, if possible, enhanced.

Presently, there is no clear and established pedestrian access from the city core area to the riverbank. Access should be safe and well oriented towards the river. Potential conflicts between pedestrian and vehicular traffic need to be minimized, if not eliminated. Future public car parking areas for use by riverside open space

visitors should be suitably landscaped with planted berms or trees and shrubs. Separate sections for car parking need to be reserved for the handicapped visiting the riverfront public areas.

The question of establishing open space uses adjacent to the Bow River at this location is important specifically in relation to: the "Proposed Inner City Plan" and the "Proposed Downtown Plan" proposals which call for the necessary revival of the downtown in relation to the proximity to the Bow River and Prince's Island to the north. In the case of new commercial and residential developments, open space uses, public or private, will play a vital role in the creation of a harmonious and pleasant urban environment for people living or working in the downtown area.

A2.1.2.2 Inglewood Golf Course to Fish Creek:

The major land-based recreational resource features located along this reach of the Bow River are the Inglewood Bird Sanctuary, Beaver Dam Flats Park and Carburn Park, all of which are basically undeveloped. These recreational resource features provide mainly for passive recreation e.g., nature studies, watching wildlife, picnicking, walking, and horse riding. The City of Calgary and the Province of Alberta own large parcels of land adjacent to the Bow River south of Carburn Park; these lands have excellent potential for land-based recreational opportunities. The Provincial Government and City land ownership is shown in the following table: (Ogden Rd. to Fish Creek)

Land Owner	Existing Parkland approx. acres	Other Land approx. acres	Deerfoot Trail Corridor approx. acres	Land Developable for Uses Other Than Parks approx. acres	Remainder of City-owned Land: Potential Rec. Space approx. acres	Total Recreational land approx. acres
City of Calgary	125 (50.63 ha)	-	-	-	-	125 (50.63 ha)
City of Calgary	-	735 (297.68 ha)	155 (62.78 ha)	230 (93.15 ha)	350 (141.75 ha)	350 (141.74 ha)
Province of Alberta	620 (251.1 ha)	-	-	-	-	620 (251.1 ha)

It should be noted that the Provincial Government land included in the above table extends only to the north end of the Fish Creek Sewage Treatment Plant. All of this land has been designated as a park - Fish Creek Provincial Park.

The City-owned and private lands along this reach of the Bow River are not intensively developed. Large portions of these parcels which are undeveloped are located immediately adjacent to the river within the floodway. Because of their location in the floodway, these areas will be dedicated as Environmental Reserve as and when these parcels are subdivided. In accordance with The Planning Act, 1977, Environmental Reserve land so dedicated can be retained in its present form or utilized as a public park.

On October 23, 1979, City Council approved the Riverbend and McKenzie Area Structure Plans. The Riverbend residential area is located immediately east of the Bow River and south of Glenmore Trail S.E., while the McKenzie residential area is situated east of the Bow River and immediately north of Highway 22 (current city limits). As a result of these Area Structure Plans, lands in the floodway have been established as Environmental Reserve. On June 17, 1980, City Council additionally approved an Area Structure Plan for the Barlow area located east of the Bow River between the communities of Riverbend and McKenzie. Under the aforementioned Area Structure Plans, a continuous open space system has been established along the eastern bank of the Bow River between Glenmore Trail S.E. and Highway 22 S.E.

Therefore, the areas adjacent to the Bow River in the southeast sector of the city offer excellent potential in terms of opportunities for future land-based recreational development of a diversified nature e.g., regional parks, extension to the existing golf courses, picnic areas, walkways/pathways, tennis courts, football fields, cross-country skiing trails, baseball diamonds, interpretive points, public view points, canoe launching points and other facilities for both active and passive recreational activities. In addition, opportunities also exist for preserving wildlife habitats (in areas such as the privately owned Cominco natural area and environmentally significant areas owned by the City and the Province).

The existing open space natural areas are of high quality in terms of fragility, rarity and diversity of existing vegetation and wildlife habitats. These areas provide shelter for wild animals and allow them to move freely in the river valley. Cominco natural area and the Inglewood Bird Sanctuary are excellent examples of such natural areas which offer unique opportunities for outdoor education and recreation.

A2.1.3 Water Quality:

The following information is based on "A Discussion of Water Pollution Within the City of Calgary", December, 1978 (updated March 12, 1981) prepared by the Water Quality Control Branch of the Alberta Department of the Environment (refer to Appendix IV).

According to long term historical data the water quality of the Bow River water coming into the city is good in all respects.

A2.1.3.1 Bowness Park to Inglewood Golf Course:

Within this reach of the Bow River, the water quality is acceptable. Certain pollutants enter this reach of the river in storm sewer discharges. These pollutants are contained in runoff which includes debris and contaminants from streets and open land areas, air deposited substances, ice control chemicals, and dirt and contaminants from vehicles.

Loadings are sporadic due to variations in precipitation intensity and duration. Industries or institutions (excepting Foothills Hospital) are not licensed to discharge wastes into the storm sewers. Therefore, flows other than during storm events consist mostly of groundwater infiltration into storm sewers and groundwater from construction sites. The river remains of good quality until points below the Bonnybrook Bridges, (Ogden Road S.E.) where the Bonnybrook Sewage Treatment Plant is located.

A2.1.3.2 Inglewood Golf Course to Fish Creek:

In this reach of the river, effluents from the Bonnybrook and Fish Creek Sewage Treatment Plants cause the levels of bacteria, phosphorous (six times) and nitrogen (four times) to rise above provincial objectives. As a result, the water quality in this section of the Bow River is not suitable for primary (body) contact recreation. The following table shows the daily average river loading of biochemical oxygen demand (B.O.D.) for the two sewage treatment plants:

	1977-B.O.D./Day	1978-B.O.D./Day	1979-B.O.D./Day	1980-B.O.D./Day
Bonnybrook (Secondary) Treatment	2892 kg- 6362 lbs	4981 kg- 10981 lbs	4213 kg- 9269 lbs	4810 kg- 10582 lbs
Fish Creek (Secondary) Treatment	5790 kg- 12765 lbs	5814 kg- 12818 lbs	7039 kg- 15486 lbs	2760 kg- 6072 lbs

Source: Alberta Department of the Environment

In view of the above information, it seems that these daily average river loadings increase with city growth. The Alberta Department of the Environment is presently conducting a water quality study of the Bow River. Phosphorous content in the Bow River and the implications of its removal from sewage effluent is a part of this study.

On the other hand, the City of Calgary is presently in the process of expanding the Bonnybrook Sewage Treatment Plant. As a part of this expansion, priority consideration will be given to the removal of phosphorous from sewage effluent. The Fish Creek Sewage Treatment Plant was recently expanded to increase its average design capacity from 8 million gallons per day to 16 million gallons per day to provide secondary treatment facilities.

Therefore, it is expected that future industrial effluents should be of lesser quantity and improved quality. There is potential for improvement of pollution abatement technology in the private sector. The potential also exists for making further improvements to the quality of the water of the Bow River by reducing the phosphorous content of municipal effluents.

A2.1.4 Public Access To The River:

One of the objectives of this plan is to develop the rivers/creeks and their valleys as a focal point of year round recreational activities and to promote awareness of the watercourses in relation to the overall development of the city. In order to achieve this objective, it must be realized that some form of public access to the rivers/creeks and their valleys must be secured. Without good public access, recreational facilities adjacent to the rivers/creeks are redundant and, therefore, it is a waste of effort to provide such facilities. In the absence of public access, it is difficult to perceive or promote awareness of the creeks, rivers, valleys, residential communities and the city.

When access is made available, it must be well oriented towards the point of destination and be safe to use such that users are able to experience harmony and diversity of recreational opportunities along the rivers and creeks. Potential conflicts between public access and other private land uses must be minimized, if not completely avoided.

Since the Bow River has excellent recreational resource capacity potential and location with respect to the City of Calgary and the Calgary region, public access to the river is essential for the optimum enjoyment and benefit of the people.

A2.1.4.1 Bowness Park to Inglewood Golf Course:

Within this reach of the Bow River, the lack of continuous public access along the right bank between Bowness Park and Edworthy Park is due to private land ownership. These private lands along the south bank of the river include vacant areas and the existing residential development in Bowness.

However, it is noted that public access to and, in certain cases, along the riverbank adjacent to Bowness is available at different locations along 48 Avenue N.W., Bow Crescent N.W. and Bowbank Crescent N.W. Easements for public access have been obtained through some residential properties as a result of subdivision/development on these private properties. However, no walkways/pathways were actually developed. The existing walkway/pathway system through Bowness is a combination of separate riverbank walkways/pathways and street sidewalks, and provides sufficient access to the river at this stage.

However, it must be stressed that the Bow River has excellent potential for year round recreation (land-based and water-based) at the regional level with respect to its recreational resources and its location in relation to the City of Calgary overall. Therefore, demand for future public access to or along the river will depend upon any changes in the existing land use pattern adjacent to the river (e.g. resubdivision or redesignation of lands) and the future need for regional open space uses.

Major portions of the existing privately owned large parcels adjacent to the Bow River between Edworthy Park and the Trans Canada Highway west are currently undeveloped. Therefore, an opportunity will exist to negotiate, at the time of development, for the provision of public access to and along the adjacent riverbank.

Along the left bank of the Bow River between 85 Street N.W. and Shouldice Athletic Park, there are three locations where no public access to the river is available. These locations are: Fournier property, private residential properties between Shouldice Bridge and 21 Avenue N.W., and private properties between 48 Street N.W. and the Trans Canada Highway west. However, at this time, these three riverbank locations do not seriously affect the efficiency of the existing riverbank walkway/pathway system in this area. It would be desirable, though, to maintain a continuity in the existing riverbank walkway/pathway and to specifically eliminate the existing pedestrian crossing on Bowness Road N.W. opposite 52 Street N.W. where there is a risk of conflict between high volumes of vehicular traffic and pedestrians.

The following tables show public and private ownership of riverbank lands between Bowness Park and Edworthy Park, along the right and left banks respectively.

Bowness Park to Edworthy Park (H. Boothman Bridge)
Right bank = 5.19 miles (8.30 km)

Ownership	Length of Riverbank	Public Access
Public	2.76 miles (4.42 km)	Yes
Private	2.43 miles (3.88 km)	No

West of 85 Street N. W. to H. Boothman Bridge
Left bank = 4.94 miles (7.90 km)

Ownership	Length of Riverbank	Public Access
Public	2.84 miles (4.53 km)	Yes
Private	1.34 miles (2.14 km)	No
Private (Klippert)	0.76 miles (1.22 km)	Yes

Apart from the residential communities of Silver Springs, Varsity and, to a certain extent, Wildwood, there are no separate walkways/pathways specifically designed to provide direct linkage between the riverside communities and the existing public open space uses adjacent to this segment of the river. Thus, it is desirable that future Area Structure Plans or Area Redevelopment Plans, for new and older areas respectively, include walkways/pathways to allow access between the riverside communities and adjacent riverbanks.

Across the Bow River from the community of Bowness there is a public regional park (Bowmont Park) which has considerable recreational potential due to its size, topography, vegetation and location. Excepting the communities of Silver Springs and Varsity, there is no direct pedestrian access or vehicular access to this large riverside park from the south bank between the 85 Street N.W. Bridge and Shouldice Bridge. The distance between these two bridges is approximately 2.75 miles (4.4 km). To facilitate a loop trail in the existing walkway/pathway system a pedestrian bridge over the Bow River and the use of the sidewalk on the south side of Bow Crescent N.W. will be needed. Such a bridge will also provide direct pedestrian access to Bowmont Park from the south bank of the Bow River.

Between the Trans Canada Highway west bridge and Deerfoot Trail, pedestrian access to the Bow River is generally restricted by Memorial Drive running parallel to the north bank of the river making pedestrian access to the riverbank areas difficult and hazardous. Although there are at-grade pedestrian crossings on Memorial Drive, there is a risk of conflict between pedestrians crossing this major thoroughfare and the heavy vehicular traffic using the road.

On the south side of the Bow River, there are no pedestrian crossings on Bow Trail west of 11 Street S.W. Although there is public access along the riverbank, direct pedestrian access to the riverbank is not available from the adjacent areas. Without controlled pedestrian crossings it is unsafe for pedestrians to cross Bow Trail which carries high volumes of vehicular traffic. It is, therefore, essential to provide pedestrian crossings at suitable locations on Bow Trail. Such pedestrian crossings should have traffic lights, where warranted, to facilitate the safe crossing of major vehicular traffic routes by pedestrians.

There is no public access to or along the south bank of the Bow River adjacent to New Street S.E. between 13 Street S.E. and 15 Street S.E. This is due to the present private ownership of residential properties abutting the

river. This private ownership of riverbank land does not have serious impact on the efficiency of the present riverbank walkway/pathway south of the river on New Street. Furthermore, no public access is available to or along the left bank of the river adjacent to the existing Inglewood Golf Course. The golf course land is City-owned and is leased to two private companies for golfing and skiing (downhill and cross-country). It is stressed that, in the case of development on publicly owned lands abutting the rivers and creeks, provision be made for public access to the watercourses.

A2.1.4.2 Inglewood Golf Course to Fish Creek:

In this reach of the Bow River, public access to the river is available wherever publicly owned lands abut the watercourse. There are two City-owned parks (Beaver Dam Flats and Carburn) along the left bank of the Bow River which presently allow public access adjacent to the riverbank. Fish Creek Provincial Park is located approximately between 126 Avenue S.E. and Fish Creek adjacent to the right bank of the Bow River. This major Provincial Park occupies about 8 miles (12.8 km) of the riverbank and facilitates excellent public access to the Bow River along its entire frontage.

Public access to and along the banks of the Bow River is also available through other City-owned lands adjacent to the river which are either developed or vacant. In addition, access to and along the river is possible through private lands which are not fenced to the river's edge, e.g. C.P.R. land immediately south of the Inglewood Bird Sanctuary, and most of the lands (Genstar, C.I.L. and Daon Development Corporation) located east of the Bow River between approximately 92 Avenue S.E. and the current southeast city limits. With the exception of public access through the C.P.R. land, the access is not legalized through the remaining private lands.

No public access to the Bow River is presently available through private lands located between 58 Avenue S.E. and Cominco, and from 102 Avenue S.E. to 118 Avenue S.E. (Conmac). The present lack of access through the Cominco property will not, in the immediate future, have any adverse impact on the efficiency of walkways/pathways in this area. However, in the event of resubdivision of and/or redevelopment on the above land, a public walkway/pathway through the property would be desirable. A public walkway/pathway through Conmac property adjacent to the riverbank is needed to provide a linkage between the walkway/pathway existing at the north end of Fish Creek Provincial Park and the City-owned open space north of Conmac (proposed regional park).

Respecting the Barlow area located between Riverbend and McKenzie, an Area Structure Plan was approved by City Council on June 17, 1980. According to this plan Environmental Reserve land will be located adjacent to and along the left bank of the Bow River to provide public access to the river. To promote and maintain awareness of the river system, separate walkways/pathways are expected to be designed to provide general pedestrian access to the Bow River from the new riverside residential communities of Riverbend, Barlow and McKenzie.

A2.2 The Elbow River

A2.2.1 Water-based Recreation:

A2.2.1.1 Canoeing/Rafting/Swimming/Skating:

Canoeing and rafting are very popular recreational activities on the Elbow River. Currently, there is only one canoe launching point along the river - Sandy Beach.

Additional canoe launching points need to be provided so that canoeists can fully utilize the Elbow River between Glenmore Dam and the Stampede Grounds.

Because of low water flow levels, canoeing along the entire length of the Elbow River is often not possible. In some sections of the river, the water level is so low that canoeists must carry their canoes for a considerable distance to the next launching point. Skating in winter is possible at only a few restricted locations also because of very low water levels. During the summer months swimming is a very popular activity in the Elbow River and it is enjoyed by many people. Improved water flow levels would further encourage year round recreational activities and promote greater awareness of the river system and the adjacent diverse recreational opportunities. However, the operation of Glenmore Dam for the provision of an adequate potable water supply to meet the city's needs must necessarily take priority over the accommodation of recreational activities on the river.

A2.2.1.2 Fishing:

The Elbow River between the Glenmore Dam and its confluence with the Bow River provides sports fishing for all age groups. The type of fish most frequently caught is Mountain Whitefish although Brown Trout and Rainbow Trout, which are fewer in number, are usually preferred by fishermen. Other species found in this river include Cutthroat Trout, Brook Trout and Northern Pike. During May to October (spring and fall spawning season), extreme variations in mean daily discharge flows have an adverse effect on the fishery. These sudden surges in water flow volume and water velocity create a shift in bottom sediments which results in fish spawning areas being scoured or smothered by excessive siltation. The water quality in the Elbow River is relatively good and has no negative impact on the fishery.

Currently, access for fishermen is good along the river in areas of fairly heavy angling pressure, particularly below the Glenmore Dam and through the public parks located adjacent to the Elbow River.

Although fishing is a popular activity on the Elbow River, the sport can only be enjoyed for a limited period of time since the river is either frozen, or water flow levels are very low for much of the year. Higher water flow levels would encourage use of the river by greater numbers of fish. The size of the fish in the river would also tend to increase.

A2.2.2 Land-based Recreation:

There are various types of land uses adjacent to the Elbow River. These uses are: public parks, a private golf course, institutional, industrial, commercial and residential. Land uses which provide recreational opportunities include a golf course, public parks and the Stampede Grounds. The existing land uses are diverse and harmonious and offer a variety of recreational experiences.

The percentage distribution of the aforementioned riverbank land ownership is shown in the following table. (Both riverbanks of approximately 7 miles (11.2 km) each, are included):

Public Recreational Facilities (E.g. parks)	City-owned Leased Land (Stampede Grounds)	Private Recreational Facilities (Golf Course)	Industrial/ Commercial/ Institutional	Residential (Single Family & Multi-family)
61.7%	6.09%	6.87%	5.55%	19.79%

From the above information it is evident that the existing public and private recreational open space uses form a major part of the riverbank lands. Within the overall framework of the existing public parks, numerous facilities are provided for both active and passive recreational activities. These recreational facilities are: field hockey and football fields, tennis courts, baseball diamonds, swimming pools, adventure playgrounds for children, picnic areas, interpretive trails, natural areas, and walkways/pathways. Most of the public open space uses adjacent to the river can facilitate additional recreational activities such as skating and cross-country skiing during the winter months. However, these recreational facilities are overcrowded particularly during the summer months.

Although public parks are suitably integrated with other land uses and the Elbow River itself, general access roads to certain parks are not appropriately located specifically in relation to the surrounding riverside residential communities. During peak periods in the summer months, people are compelled to use the local residential streets, because of traffic congestions on access roads, to gain access to these public parks. Moreover, parking facilities in some of these major public parks appear to be inadequate and, as a result, people are forced to park their cars on streets in the adjacent residential areas. Therefore, residents of riverside neighbourhoods experience inconvenience in terms of traffic congestion, and noise and pollution caused by the 'spill over' of vehicular traffic from these pubic parks.

In view of the foregoing, it is essential that future riverside recreational uses are well integrated with the river corridor and access roads to such facilities are carefully located in relation to adjacent residential development. In order to make the Elbow River valley more attractive and enjoyable for the general public, future land-based recreational facilities must be integrated with water-based activities taking place on the river (e.g. canoes/rafts storage place ---> launching point ---> canoeing/rafting on the river). However, it is emphasized that because of the river's small size, its proximity to highly developed areas and its limited regional recreational resource capacity there is little potential for additional major regional land-based recreational uses that can be supported by this river.

A2.2.3 Water Quality:

Since the Elbow River currently receives the least amount of any kind of wastewater, it is subject to the least amount of deterioration within the city limits. Although the Elbow River receives contaminants contained in urban runoff carried through storm sewers emptying into the river, the water quality remains suitable for primary (body) contact recreation.

A2.2.4 Public Access to the River:

The current Elbow River walkway/pathway system is a combination of public roadways and separate walkways/pathways through public lands abutting the river. It is a continuous system which allows pedestrians to walk between Fort Calgary and Glenmore Athletic Park located north of Glenmore Dam Bridge Road S.W.

Between Glenmore Athletic Park and Glenmore Park there is no linkage in terms of a separate public walkway/pathway. Since Glenmore Park is a major recreation node designed for the enjoyment and benefit of the people, it is essential that a walkway/pathway be provided between this park and Glenmore Athletic Park to maximize their use. Such a walkway/pathway can be constructed on the present City-owned land between these two recreation nodes. The aforementioned missing link in the present walkway/pathway system is important in terms of maintaining continuity in the present walkway/pathway system. Therefore, it is considered a matter of high priority.

Regarding the existing public access to and along the river, citizens have expressed concerns about serious problems regarding the lack of security, protection and privacy for riverside residential neighbourhoods. In addition, questions have been raised regarding the physical effect of the construction and the implications of the subsequent use of future riverbank walkways/pathways. The use of public walkways/pathways has been perceived as detrimental to the safety and quiet enjoyment of their homes by the residents. They do not want to lose land to a walkway/pathway system which threatens their way of life. Also, the policing of riverbank walkways/pathways and parks is considered by the riverside residents to be inadequate.

For more detailed concerns expressed by citizens, refer to Appendix XVIII "The Riverbank Problem - Security, Protection and Privacy for Riverside Residential Neighbourhoods.

The following table shows the percentage distribution of riverbank land ownership immediately adjacent to the river between the Glenmore Road Bridge and Fort Calgary.

Ownership	Public Access	Percentage of Riverbank	Total River Frontage
Publicly Owned Riverbank	Yes	61.70%	8.63 miles (13.81 km)
Privately Owned Riverbank (Developed)	No	25.35%	3.55 miles (5.68 km)
Public Land Leased (Stampede Grounds)	No	6.09%	0.85 miles (1.36 km)
Privately Owned Riverbank (open space use - Golf & Country Club)	No	6.86%	0.97 miles (1.55 km)

Compared to the Bow River, the Elbow River within the city limits is narrow and small in size. Because of its size and location adjacent to developed areas, the river has limited resource and recreational capacity at the regional level in relation to the overall city. The river seems to have adequate capacity for local community recreational opportunities. The existing land uses (public and private) adjacent to the river are diverse and they present a harmonious pattern of development. Therefore, based on factors such as the existing extensive development adjacent to the river and restricted resource and recreational capacity of the Elbow River, the amount of public access available to and along the river adjacent to the existing residential development is currently adequate. However, it should be noted that demand for future public access to or along the riverbanks of the Elbow River will depend upon any changes in the existing land uses adjacent to the river (e.g. resubdivision or redesignation of lands) and the need for additional open space uses adjacent to the river.

Furthermore, it is emphasized that in order to maximize the use of recreation nodes adjacent to the Elbow River, a number of looped trails will be needed. Currently, there are three locations where trails are necessary to complete a loop system in the existing walkway/pathway system. These locations are: the Calgary Golf and Country Club golf course, the Roman Catholic Cemetery, and the Stampede Grounds. Due to the present lack of public access along the riverbanks adjacent to the above properties, pedestrians must use the existing streets which are, in all these cases, located on the average more than 2500 ft. (762 m) away from the river. Effective use of the existing open space adjacent to the river is very difficult without such looped trails.

The aforementioned loops are normally based on a two mile (3.2 km) walking distance on one side of the watercourse, so that a pedestrian is able to walk to a point along one side of the river (using street or riverbank) where he can cross the river via a separate pedestrian bridge or a vehicular traffic bridge and then return to his point of origin by walking a two mile (3.2 km) distance on the other side of the river (using street or riverbank). This loop system is in accordance with the City of Calgary Parks/Recreation Department's "Policy Statement and Planning Recommendations", June 1976 (revised June 1977).

A2.3 Nose Creek

A2.3.1 Water-Based Recreation:

At present, the creek has no sports fish populations in the vicinity of Calgary. The stream provides a marginal habitat for only the most tolerant fish species (e.g. Pike).

The quality of fish habitat in this creek is considered to be very poor due to various factors. Nose Creek is intermittent in most years because of its limited watershed. During the summer months the stream becomes stagnated which creates adverse chemical and physical conditions. Agricultural uses have been present in this general area for many years. Activities such as overgrazing and development have caused bank destruction, siltation and eutrophication which seriously restrict the capacity of Nose Creek to support fish populations.

Future potential of Nose Creek to support recreational fishing is extremely low. The future type of land uses and stormwater input to the creek will play an important role with respect to the quality of the stream. Because of the present poor water quality and very low water levels in the creek, canoeing and swimming are not

possible. However, Nose Creek valley appears to have potential for artificial lagoons for a variety of water-based recreational activities such as canoeing, rafting, paddling and skating. Artificial lagoons can be utilized for storing stormwater (surface runoff from adjacent areas). These types of recreational activities can be enjoyed year round and the valley would become a focal point for such activities (refer to the Nose Creek stormwater management study to be completed in 1981 by the Alberta Department of the Environment, and the City Parks/Recreation Department's "Water Recreation Resources Study" - October 1980). In addition, artifical lagoons or lakes will no doubt enhance the existing riverine characteristics of the Nose Creek valley.

A2.3.2 Land-Based Recreation:

Presently, some of the main land-based recreational activities in the Nose Creek valley are: golfing, jogging, walking, cross-country skiing, tobogganing, tennis, and informal play.

Because of its location, the Nose Creek valley functions as an important link between the existing Zoo (Bow River) to the south, and West Nose Creek and Nose Hill Park to the northwest. There is no walkway/pathway or other form of continuous public open space along the creek to provide a linkage between the Bow River, West Nose Creek and Nose Hill Park. Therefore, a provision of additional open space uses can improve the valley as a vital link in the city-wide park system.

At this stage, there are no major park facilities similar to Bowness Park in the north and northwest areas of the city. There is also a general lack of fully developed recreational facilities in the valley adjacent to the existing residential neighbourhoods between Memorial Drive S. E. and 80 Avenue N. E.(e.g. open space for informal and formal play, tobogganing, walkways/pathways, and football fields). Moreover, as the city expands to the north, additional regional open space will be needed to meet future demand for recreational facilities.

With respect to its location, size and general flat topography of the valley bottom, Nose Creek has an excellent potential for developing recreational facilities such as golf courses, playgrounds, baseball diamonds, tennis courts, toboggan hills, picnic areas, interpretive trails explaining natural areas, cross-country skiing trails, and artificial lagoons for skating in winter and canoeing, paddling in summer. All these recreational uses will definitely add to the value and future recognition of the entire Nose Creek valley between the Bow River and the northern city limits.

A concept plan for Nose Creek between the Bow River and 80 Avenue N.E. was approved by City Council on March 9, 1976. According to the plan, a north-south regional open space system has been established. The areas designated as future regional open space are presently owned by the City and private land owners. The above concept plan was revised by the City Parks/Recreation Department and the amended plan was approved by City Council on July 23, 1979. However, it is further noted that the Parks/Recreation Department engaged a private consultant to modify the approved plan with respect to additional public input and the possible future need and demand for various types of recreational uses which can be provided in the Nose Creek valley between the Bow River and 80 Avenue N.E. (refer to "Nose Creek Valley Master Plan" - February 1980). Proposals for the section of the creek north of 80 Avenue N.E. to the current city limits are included in this study.

A2.3.3 Water Quality:

At the outskirts of the City of Calgary, Nose Creek appears to be of marginal quality, and deteriorates further within the lower reach where it receives storm water. Nose Creek near its confluence with the Bow River has a mean phosphorus and nitrogen concentration which exceeds the provincial objectives by three and two times respectively.

However, total suspended solids are much higher, and because West Nose Creek does not contribute to these suspended solids, it is very likely that the source of the additional particulate material is discharges from the storm sewers which empty into the lower reach of Nose Creek. The large amounts of phosphorus found in the lower reach of the creek are associated with this particulate material.

Additionally, the total coliform count for Nose Creek near its mouth has been found to be greater than 2400 per 100 ml, which makes it unsuitable for primary (body) contact recreation.

In view of the rapid growth of the city, there is a need to control future stormwater inputs to the creek. Therefore, the Alberta Department of the Environment has already initiated a stormwater management study of the Nose Creek Basin. This study is scheduled to be completed by the end of 1981. The study will also determine the possibility of installing weirs to maintain water flow levels in the creek.

Furthermore, there is a need to control future industrial development adjacent to Nose Creek because of the pollution problem.

A2.3.4 Public Access to the Creek:

General access to the creek is hindered from the east due to the existing industrial development, Deerfoot Trail and the C.P.R. line between 80 Avenue N.E. and Memorial Drive. Along the west side of the creek general access is currently possible but it is not legalized. However, public access to and along the west side of the creek will be provided in accordance with the amended Nose Creek Concept Plan approved by City Council on July 23, 1979. A multi-use trail forming a continuous linear park system will be designed to allow easy access to the proposed "Nose Creek Valley Park". A series of shorter loop walkways/pathways will also be provided to facilitate a less demanding recreation experience and still allow enjoyment and appreciation of the "Nose Creek Valley Park" and its facilities.

North of 80 Avenue N.E. to the current city limits public access (paved walkways/pathways or dirt trails as public rights-of-way) to and along both sides of the creek does not exist because the lands adjacent to the creek are privately owned. As the creek runs between the C.P.R. line and Deerfoot Trail access is restricted. Deerfoot Trail moves away from the creek in a northeasterly direction, thus leaving adequate area for possible future development which, if properly planned, can provide good pedestrian access to the creek from the east. Along the west side of the creek, the C.P.R. line runs almost parallel and close to the watercourse. Between the C.P.R. line and the creek there is insufficient land to permit any major development. Therefore, an opportunity exists to plan walkways/pathways to provide a linkage between the future Calgary North development and Nose Creek, and also to maintain a continuous recreational open space between the creek and the C.P.R. line.

It must be realized that the Nose Creek valley has good potential in terms of local and city-wide recreational uses. Since the city is expanding rapidly to the north, access to the valley and the creek will play a vital role with respect to the present need for recreational facilities being proposed in the Nose Creek valley within the plan boundary. The proposed walkways/pathways in the Nose Creek valley will provide an important link between Calgary North, West Nose Creek, and the Bow River riverbank walkways/pathways.

A2.4 West Nose Creek

A2.4.1 Water-Based Recreation:

The present water quality is poor and water flow levels are very low. Therefore, the stream is unsuitable for primary (body) contact recreation.

As mentioned earlier under the Nose Creek section, the Alberta Department of the Environment has initiated a stormwater management study for the Nose Creek Basin including West Nose Creek. The study has delineated the floodplain, and will recommend on the feasibility of retaining water in the basin for recreational purposes and the feasibility of installing weirs to maintain water flow levels, and outline a policy for managing water in the basin, specifically with regard to storm sewer discharge within the City of Calgary. It is estimated that the study will be completed by the end of 1981.

A2.4.2 Land-Based Recreation:

The creek valley is presently used primarily for cross-country skiing and to a limited extent for walking through mostly private lands. Since most of the adjacent lands are privately owned, no public recreational facilities are developed. However, the creek valley has excellent potential for active and passive recreational opportunities such as tobogganing, cross-country skiing, walking, jogging, bicycling, skating and enjoying views of the city skyline, natural areas and wildlife existing in the valley.

As the creek valley forms a vital linkage between Nose Creek to the east and Nose Hill Park to the south, it is essential that future land-based recreational uses in the West Nose Creek valley provide good continuity along the creek in an east-west direction. Such continuity in open space uses will establish the creek valley as a focal point of recreational activities. When recreational uses are developed they will hopefully promote awareness of the creek regarding its benefits and enjoyment to the people.

A2.4.3 Water Quality:

The water quality of West Nose Creek has likely evolved with agricultural activities in that the creek moves slowly through primarily rural pastureland and because its discharge is low, its water quality is impaired. The nitrogen content noted in October 1978 was less than the provincial objectives, however, the phosphorus objective was not met. The total dissolved solids indicate that the water is of a poor quality.

In addition, total coliform bacteria exceed 2,400 per 100 ml., a level which is not suitable for primary (body) contact recreation.

Since the city is expanding rapidly in a northerly direction, there is a need to control future stormwater discharges into the creek.

A2.4.4 Public Access to the Creek:

Along the entire length of the creek within the plan area, there is no public access (paved walkways/pathways or dirt trails as public rights-of-way) except where road allowances cross the creek. Lack of public access is due to the present private ownership of lands adjacent to the creek. The majority of land abutting the creek is presently undeveloped. Recently, a policy report (approved by City Council on July 22, 1980), including an Area Structure Plan for Calgary North, has been prepared by a private consultant retained by the City of Calgary Planning Department. Under the aforementioned Area Structure Plan the concept of a continuous recreational open space including walkways/pathways has been established. The future walkways/pathways along West Nose Creek will create a vital linkage between the proposed "Nose Creek Valley Park" and Nose Hill Park to the south.

When the recreational uses in the Nose and West Nose Creek valleys are developed and adequate access to these facilities is provided, it will no doubt create greater awareness of these valleys which will hopefully become a focal point of year round recreational activities.

A2.5 The Bow and Elbow Rivers, Nose and West Nose Creeks

A2.5.1 Flooding Hazard:

Bearspaw Dam was constructed on the Bow River in 1954. The reservoir is primarily used for generating electricity and for controlling only short term flow fluctuations in the Bow River. It should be noted that Bearspaw Dam will have a negligible effect in controlling a major flood. In accordance with the Montreal Engineering report, "City of Calgary Flood Study, Volume 1, Bow River Report" completed in May 1973 for the Water Resources Division of the Alberta Department of the Environment and for the City of Calgary, significant summer flooding in Calgary will occur when flows in the Bow River (above the Elbow River) are of the order of 20,000 to 25,000 cubic feet per second.

The potential for flooding is greatest during the June-July period when mountain runoff is at its peak and severe summer storms are most likely to occur. Winter flooding is caused by ice jams and is of prime concern to the City of Calgary. During the years of 1945-46, winter inundation of considerable magnitude occurred in the city, specifically in the Bowness, Hillhurst and Sunnyside areas adjacent to the Bow River.

The risk of winter flooding on the Bow River has been reduced mainly because of the construction of Bearspaw Dam in 1954, a reduction in monthly winter flows in the river due to lesser reliance on the hydro-electric plants on the Bow River above Calgary for electricity, dykes through the central districts of the city, and construction of the Ice Pack Anchorage in 1959, downstream from Louise Bridge (10 Street N.W.). According to the Montreal Engineering report, May 1973, the effectiveness of the Ice Pack Anchorage has decreased since its inception due to partial infilling by gravel carried along by the river. Although the above mentioned works have reduced the likelihood of a severe winter flood, a potential hazard remains as illustrated by the winter flood of 1966 when the dykes protecting the Sunnyside community were topped by floodwaters.

According to the Monenco Consultants report, "Elbow River Flood Study", dated December 1979, the construction of Glenmore Dam has reduced the 1% probability flood of 28,000 cubic feet per second to a flood of 20,300 cubic

feet per second. Although the construction of Glenmore Dam on the Elbow River has reduced the risk of serious flooding, there is still a major potential hazard.

The flood prone areas adjacent to the Elbow River are extensively developed and no effective development control with respect to the flooding problem has taken place. To date there is no specific floodplain management policy for the Elbow River. In the event of a major flood, damage costs will be very substantial.

The floodplain along the Bow River between Bowness Park and Inglewood Golf Course has been intensively developed mainly for public parks, vehicular traffic use, and residential and industrial development with some commercial uses. Although the City of Calgary has a floodplain management policy with respect to the Bow River, the existing policy is neither comprehensive nor firm in terms of clarity and land use planning or development controls in the river valley. The current policy has not been incorporated into the Land Use By-law or the Calgary General Municipal Plan.

City Council's present policy guidelines (refer to Appendix II) for development in the floodplain of the Bow River were adopted by City Council on June 24, 1974. The current floodplain management policy guidelines are mandatory in the following instances:

> "i) in the case of undeveloped property;
> ii) in the case of large developments involving an area of one city block, or greater;
> iii) in the case of spot development which is located in a block where the majority of property owners have already recognized the floodplain management guidelines in their developments."

According to the present policy, all developers proposing construction in the floodplain districts of the Bow River are provided with the development guidelines which are mandatory only in the cases stated above. The applicability of the present policy is not adequately clear and, therefore, all development occurring in the floodplain is not necessarily subject to the current policy guidelines.

For example, according to condition "i)", above, construction on undeveloped properties shall be subject to the floodplain management policy guidelines, and yet under condition "iii)", development is, in fact, permitted without any restrictions as there is no prior "majority" of property owners who have complied with these guidelines.

As a result of the present procedures a large number of vacant sites existing in the floodplain can, therefore, be developed without having to comply with the current policy. Clearly, an inconsistency exists between conditions "i)" and "iii" of the present policy.

In accordance with the Montreal Engineering report, May 1973, there were approximately 2,500 dwellings and 350 commercial and industrial establishments located in the floodplain of the Bow River which would be directly affected by overland flows (70 year flood: 80,000 c.f.s. above the confluence with the Elbow River and 110,000

c.f.s. below the confluence). A considerable number of residential complexes (e.g. duplexes, four-plexes and walk-up apartments) have been built within the Bow River floodplain without having to comply with the current floodplain management policy.

At the end of August 1979, it was calculated that there were approximately 2,059 single-family houses, 553 multi-family buildings and 239 commercial and industrial establishments which were located in the floodplain of the Bow River (Planning Department). Most of the redevelopment and new development excluding the Point McKay, Bow Village, Eau Claire, the Federal Government office building, and Deer Run developments, is not in accordance with the present floodplain management policy of City Council.

Based on 1973 values, Montreal Engineering estimated that damage from a flood of 80,000 c.f.s. would be about $10 million. These estimates were based on the assumption of idealized flow conditions; the possible blockage of bridges or failure of stream banks were not considered. Taking into account new development in the floodplain and the inflation factor, the damage estimate for 1980 would not be less than $50 million.

In view of the foregoing, a well-defined, firm and consistent policy is required in order to effectively control future development in the floodplain with the objective of minimizing loss of life, threat to health, and reducing economic loss by flooding.

At the public meetings held in November 1978 and in January 1979, and at Open Houses held in May/June 1979, opposition to floodplain management was expressed by the floodplain users (residents and/or property owners). Generally, the floodplain residents and/or property owners were not convinced about the possibility of a major flood through the City of Calgary. Citizens were also concerned about land use by-laws which could result from the Calgary River Valleys Plan, and that such by-laws could restrict development on lands adjacent to rivers causing properties to depreciate in value. Additionally, citizens stated that the present flood warning system should be improved and there should be a Government Flood Insurance Scheme.

The Montreal Engineering report recommendation regarding floodplain management refers to certain measures of an administrative nature aimed at managing development of the floodplain of the Bow River so as to reduce the hardship and minimize economic losses in the event of a major flood. The guidelines for floodplain management recommended by the Montreal Engineering Company Ltd. were based upon the creation of two districts, 'Floodway' and 'Floodplain' districts adjacent to the Bow River, and the enactment of certain regulations to restrict land uses and regulate development within each of the foregoing districts.

"The Bow River Impact Study (1973)" by the Lombard North Group (Impact of the Montreal Engineering report recommendation concerning floodplain management) concluded the following:

1. Floodplain management should have little or no adverse impact on the majority of the existing communities, assuming the application of land use regulations will not be retroactive, property values may temporarily decrease only to recover and stabilize.

2. Older communities located within the floodplain may be adversely affected by land use management because strict application of the plan could demand fragmented land use, thereby disrupting the existing community structure.

3. It may be necessary that the specific application of floodplain proposals to these older established communities be re-examined in the light of community needs.

While it is recognized that floodplain policies applied to new development and redevelopment can cause social and economic problems in older, low density residential areas adjacent to the rivers and creeks, it will be unwise to ignore any action with respect to reducing future flood damages occurring in the City of Calgary. In the absence of suitable corrective measures, flood damage costs will be substantial and cost figures will keep increasing if no actions are taken.

Future policies should be applied consistently to the floodplain areas in the city. If the future policies are not applied equally to the areas affected, then the main purpose of reducing flood damages will be in contradiction to the overall objective of minimizing loss of life, threat to health and reducing economic loss by flooding. In order to effectively enforce flood damage reduction policies, it will be essential to incorporate these policies into the Land Use By-law and the Calgary General Municipal Plan accordingly. However, it must be emphasized that future policies need not be retroactive because such an action will not be totally practical and, therefore, will not adequately reduce flood damages occurring to the existing development in flood prone areas of the city.

It is essential to clearly differentiate between land uses to be permitted in the floodway district and uses on adjacent lands. Land uses in areas subject to flooding can be controlled simply by establishing floodplain management policies as overlay conditions (rules without new land use districts), i.e. such conditions can be applied in addition to the development controls applicable under the Land Use By-law at the time of development on a specific parcel of land.

Potential flood damages can be reduced by land use planning in combination with suitable regulatory measures such as land use controls and building regulations applied to new development or redevelopment taking place in the flood prone areas. In formulating future policies and advisory guidelines, it is important that factors such as the minimization of economic and social hardships with respect to redevelopment or new development are taken into account.

A2.5.2 Transportation Corridors Adjacent to the Watercourses:

Within the inner city section of the Bow River there are two major transportation corridors, namely Memorial Drive and Bow Trail, located north and south of the river respectively. In each of the these cases, a series of road widenings has reduced the width of the riverbank land.

In the case of the Elbow River there are transportation rights-of-way which restrict the effective use of riverbank areas by the public for recreational purposes. Examples of these are: 1 Street S.E.; 2 Street S.E.; 26 Avenue S.E. in the vicinity of Lindsay Park; Elbow Drive between 4 Street S.W. and 29 Avenue S.W.; and 26

Avenue S.W. between 4 Street and 1 Street S.W. In certain cases, the width of existing riverbank land is narrow and too steep to accommodate any useful public open space uses.

At the public meetings held in November 1978 and January 1979, citizens expressed concerns about the widening of existing transportation corridors towards adjacent creek/ riverbanks. They also stated that it has become increasingly difficult for pedestrians to cross major transportation roadways which are presently located adjacent to the rivers/creeks.

In resolving the issue of widening riverside transportation corridors, socio-economic factors are taken into consideration. Such factors are directly related to land uses that might exist at the time of development. In order to avoid any social and economic adverse impact on adjacent land owners, cost analysis is prepared for such projects prior to making any recommendations to City Council who are responsible for making a final decision.

A2.5.3 Water Flow Levels:

Fluctuations on the Elbow River through the city are influenced primarily by the operation of Glenmore Dam. During the April to August period, the average change from month to month is approximately 0.15 m (0.5 ft.) while mean monthly flows during the fall and winter months are fairly constant.

Because of low water flow levels, canoeing along the entire reach of the Elbow River is often not possible. The quality of aquatic life is also affected by low water flows. Although it is desirable to improve canoeing and the quality of aquatic life (e.g. fish) in the Elbow River, it may not be feasible in view of ensuring a potable water supply for the City of Calgary.

As previously mentioned, the Alberta Department of the Environment stormwater management study involving the Nose Creek Basin has delineated the floodplain limits and will recommend on the feasibility of retaining water in the basin for recreational purposes and outline a policy for managing water in the basin specifically with regard to storm sewer discharge within the City of Calgary.

Recognizing the need for guidelines for the discharge of stormwater into Nose and West Nose Creeks to facilitate development in the adjacent areas, interim guidelines for releases of this nature were completed by the Department of the Environment at the end of December 1979. Work on the remaining parts of the study will continue through 1981 and may necessitate amendments to the aforementioned interim guidelines.

A2.5.4 Preservation and Enhancement of the Riverine Environment

A2.5.4.1 Aesthetics:

One of the plan objectives is to maintain and enhance the existing distinctive characteristics of the riverine environment.

With respect to all the watercourses in the city, there are certain major as well as minor locations which offer excellent views of the city skyline and the river corridors. Although in some cases a substantial amount of development has occurred adjacent to the rivers and creeks, there is a strong potential for maintaining the 'openness' and 'naturalness' of these river/creek corridors.

The present meandering character of the rivers and creeks with their natural valley flats, steep escarpments, terrace formations, and natural vegetation along the river edge and riverbank slopes offer excellent visual relief to the human eye and opportunities for recreationists. The key attraction of the watercourses are their scenic qualities which are highly appreciated not only by tourists but also by the people living and working adjacent to the rivers and creeks who can enjoy the views from their respective places of residence and work.

The combination of the existing developed and open space areas adjacent to the rivers and creeks has created harmony and diversity in land use along the riverbanks which account, in part, for the visual appeal of these watercourses. Enjoying scenery is a popular form of recreation and it is one that does not involve public expenditures.

Therefore, in order to maintain and enhance the existing aesthetic quality of the river corridors and creek valleys, some control over future development affecting the landscape is required otherwise its existing distinctive characteristics will be lost.

A2.5.4.2 Natural Features:

These include geological formations such as the river and creek beds and banks, the adjacent terraces and escarpments, gravel bars, islands, glacial erratics and oxbow lakes.

Related to the Bow and Elbow Rivers and the Nose and West Nose Creeks, these features are notable because of their uniqueness and historical significance to the Calgary region. The true originality of their present natural distinctive characteristics cannot be realistically recreated. These features form the key components of the overall existing riverine landscape and its environment which is a source of enjoyment and benefit to the people. Enjoying such a landscape is a common form of recreation which does not entail expenditure of public monies.

Therefore, it is important to maintain these existing natural features with their distinctive characteristics. They depict harmony of the past and will always add to the future diversity in land uses within the city's river and creek valleys.

A2.5.4.3 Archaeological Sites:

There are a considerable number of archaeological sites located adjacent to the city's watercourses. The general areas which include these sites are shown on the Major Environmental Resource Features maps in the 'Land Use Inventory and Analysis' part of this study.

To be able to identify and appreciate the past is one's great determination and strength. Not too long ago suitable measures were taken by the Alberta Department of Culture towards establishing policy guidelines for the recognition and preservation of traditional elements with cultural and historical significance to the Province of Alberta.

As the people of Alberta are becoming more aware of their common past, they are asserting increasing pressure to have the historical traditions investigated, documented and presented in the form of public displays and publications. It is unfortunate, however, that the realities of modern life are such that major elements of the common past and identity are in grave danger of being lost before they can be properly integrated with the overall historical traditions.

According to the Alberta Department of Culture, no development is to be allowed within the areas shown on the Major Environmental Resource Features maps, without consulting the aforementioned Department. These archaeological sites require further examination and any sites of historical importance must be preserved and properly maintained.

A2.5.4.4 Snow Disposal:

The City Engineering Department is responsible for removing snow from certain streets within the city. The Department is licensed by the Alberta Department of the Environment to dispose of snow adjacent to the banks of the Bow River and Nose Creek.

There are eleven snow disposal sites in the city. Of importance to this study are the sites located immediately adjacent to the top of the riverbank. In this case, the snow is discharged into the Bow River, while at the remaining "inland sites" the snow is stockpiled on land. In the former case, when the snow is pushed down the banks of the river, existing vegetation on the site itself and the bank slopes are adversely affected. These sites are aesthetically unpleasant, prevent pedestrians from using the public walkways/pathways at these locations in spring and winter, and are in conflict with the plan objective to maintain the existing characteristics of the riverine environment.

A2.5.4.5 Disturbed Areas:

These types of areas are generally without natural vegetation and/or weeds which are fairly common to urban areas although they have no place in an urban park system. These sites have resulted from the indiscriminate use of all-terrain vehicles (four-wheel drive and trail bikes), gravel extraction, snow dumping, neglect, and the outside storage of discarded building materials.

In all cases, these sites are aesthetically unpleasant and remain disturbed due to human activity or other environmental problems such as poor soil conditions resulting from topsoil removal.

It should be noted that certain parts of the river and creek banks have been affected by erosion resulting from natural processes of the rivers and creeks and, therefore, these locations are not considered as disturbed sites outlined above.

A2.5.4.6 Riverbank Erosion:

The problem of riverbank erosion is common to watercourses as a part of the natural processes of rivers and creeks.

According to the Klohn Leonoff Consultant's report "Calgary Rivers - Structure and Erosion Condition", dated June 1979 (Appendix I), the right bank of the Bow River adjacent to Bowness Park is actually being eroded by the river. However, it is noted that the Alberta Department of the Environment and the City of Calgary have taken remedial measures to prevent erosion, and the construction of groynes was completed before the end of May 1980.

In the case of the Elbow River, there are two areas of serious concern which require immediate attention. These locations include the right bank footpath immediately downstream from the 25 Avenue S.W. bridge, and the central pier of the Stampede access bridge which is badly crushed.

Along the Nose and West Nose Creeks there are no serious erosion problems which must be attended to in the immediate future. However, it is advisable to devote attention, in the future, to two sites located approximately at the intersection of the 24 Street N.W. road allowance and West Nose Creek, and where the 96 Avenue N.W. road allowance crosses the creek. In the case of Nose Creek, attention is needed where bank erosion is occurring as a result of storm sewer outfalls.

It is necessary to take immediate remedial measures where there is an erosion problem of a serious nature.

A2.5.5 Public Awareness

A2.5.5.1 Hazards and General Information Related to the Watercourses and Adjacent City Parks:

The question regarding the availability of general information to the public concerning the city's watercourses is important since the rivers and creeks are public and influence both the urban form of the city and its residents' way of life. Information made available to the public may be basic; however, it is an awareness of the rivers and creeks which is of significance to the people living or working adjacent to these watercourses.

Concerns have been expressed by citizens with respect to the lack of signs warning the public against hazards of the rivers and creeks in the city. Before such signs are erected, suitable locations must be determined. Information displayed must be appropriate and the implication of such information in terms of other locations along the river will have to be carefully considered. A warning sign at a particular location can be misinterpreted by the general public in terms of its meaning and validity with respect to other parts of the rivers. For example, "DO NOT DRINK WATER" signs along the Bow River downstream of the sewage treatment plants may lead the public to believe that drinking water from the Bow River at other locations is safe. Therefore, it is difficult to identify appropriate locations for such signs.

However, for safety reasons, it is important for the general public to be fully aware of the nature and extent of hazards posed by the rivers and creeks as they affect water-oriented activities. Without adequate and proper information it is not possible to recognize potential hazards. Thus, some actions are needed to make the general public aware of hazards related to the city's watercourses.

A number of signs have been erected along the Elbow River, on Prince's Island and elsewhere warning of the danger of unsupervised swimming and wading as well as the number of fatalities at these locations. However, there are some hazardous locations which have not been signposted. Further signposting is needed along cross-country ski trails and pedestrian trails to avoid inadvertent trespassing on private property and to act as directional aids.

A2.5.5.2 Socially Unacceptable Behaviour:

The most common forms of socially unacceptable behaviour reported in city parks and other public areas are vandalism, theft, the use of vulgar language, drunken riotous parties, molesting and littering.

Vandalism is a form of malicious and irresponsible destruction. Examples of this are the use of all-terrain vehicles in areas with sensitive natural vegetation and the damaging of public properties e.g. park fences, picnic shelters and tables, barbecue stands and toilets. Similar damage is also inflicted upon private properties but this is not common.

Theft includes the taking of park benches, picnic tables, firewood and the removal of wooden sidings from picnic shelters.

At the public meetings held in November 1978 and January 1979, citizens expressed serious concerns about the safety of their families, damage to private properties, vulgar language, and littering and molesting. Lack of security and law enforcement were harshly criticized by residents of the riverside residential neighbourhoods.

In light of the above, it seems that regular police patrolling is essential and more effective ways and means of controlling socially unacceptable activities are needed. There is a good opportunity to utilize mounted police for controlling such behaviour in public parks. It is advisable to establish certain information and educational programs for the public and also to appropriately design parks and park facilities to discourage or prevent socially unacceptable behaviour.

B LAND USE PLANNING

B1 OPEN SPACE IN THE RIVER/CREEK VALLEYS

RELATIONSHIP TO OBJECTIVES

By devoting considerable attention to open space in the river/creek valleys the Plan directly addresses all four objectives.

1. TO ENCOURAGE HARMONIOUS AND DIVERSE USES ADJACENT TO THE RIVERS AND THEIR TRIBUTARIES

Open space is a harmonious land use. It is a low intensity use which is visually attractive and which has few adverse side effects. Whilst some problems may exist locally, as for example where intensively used regional parks abut residential districts creating occassional problems with noise, traffic and various forms of socially unacceptable behaviour, in general, open space minimizes land use conflicts. Whereas numerous potential conflicts are traditionally associated with the integration of such diverse land uses as transportation corridors, industrial and commercial uses and housing of different densities, open space is generally perceived as a positive asset by adjacent users, regardless of the nature of such land uses.

The assets may be manifest in a variety of ways ranging from economic, as when housing values are enhanced by the proximity of recreational facilities and the existence of attractive views, to social, as when open space lands geographically define an area and serve as a focus for community activities. Some types of open space may be

adversely affected by the proximity of certain land uses but adverse impacts are very rarely mutual. Open space can also prevent the juxtapositioning of incompatible land uses by physical separation. Consequently, open space lands can be regarded as complementary to all other forms of land use and can be instrumental in encouraging harmonious riverside uses.

The provision of riverside open space encourages a diversity of land uses in two ways. Firstly, it provides for a number of different types of open space in order that a considerable diversity of uses may exist between various components of the open space system; secondly, by recognizing the desirability of other land uses juxtaposed in certain areas between components of the open space system; a mixture of diverse land uses can add variety and interest to lands in the river/creek valleys providing that they are compatible with a riverside/creek setting.

2. TO DEVELOP THE RIVERS/CREEKS AND VALLEYS AS A FOCAL POINT OF YEAR ROUND RECREATIONAL ACTIVITIES AND TO PROMOTE AWARENESS OF THE RIVER SYSTEM AS RELATED TO THE OVERALL DEVELOPMENT OF THE CITY

The provision of a diverse system of open space uses is clearly instrumental in achieving the above objective. Other types of land uses do provide recreational opportunities e.g. walking, cycling and recreational driving, but these are limited compared to the great diversity of recreational activities which the public can enjoy in the various components of the proposed regional open space system. The recreational sites and facilities will create considerable opportunities for year round recreational activities and also ensure the availability of outdoor pursuits appealing to all age groups, e.g. interpretive centres and points, the creation of access links to adjacent communities, the expansion and creation of parks and golf courses (Section B1.1); an expanded trail system (Section B1.2), and the creation of a system of natural areas (Section B1.3). Particular attention is devoted to ensuring the continued viability and enhancement of popular recreational activities and sports which attract increasing numbers of participants and which enjoy committed support from associated clubs and societies, e.g. canoeing, swimming and nature study. Although problems of over-use exist locally, the range of opportunities provided by regional public recreational facilities is not fully optimized. The Plan proposes a number of measures to promote awareness of the open space system and to encourage public participation (refer to Sections B1.3.10.9 and B1.3.10.10). In the future, Calgarians will increasingly find that more of their outdoor recreational aspirations can be satisfied within the city, in the river/creek valleys open space system.

3. TO MAINTAIN AND ENHANCE THE EXISTING DISTINCTIVE CHARACTERISTICS OF THE RIVERINE ENVIRONMENT

The word 'distinctive' has clear connotations relating to quality. The term 'riverine environment' is less precise and it is helpful to consider this term in the broadest sense, namely the environment which presently exists on lands adjacent to the watercourses. Consequently, the objective embraces man-made artifacts and modified areas as well as the natural environment, and requires that the 'goods' qualities contained therein be maintained and enhanced. Implicit in the acceptance of this objective is the assumption that the poor qualities be minimized or eliminated, or at least not maintained or enhanced. A common sense application of the objective is necessary. For example, a municipal sewage treatment plant which discharges effluents damaging to aquatic ecosystems and is aesthetically unpleasant, is not a distinctive feature of

the riverine environment in the sense implied by the objective. Nevertheless its existence is indispensable for, without it, the municipality's sanitation system would collapse.

With respect to this portion of the Plan, open space is considered to be distinctive, desirable and worthy of preservation and enhancement. That is not to say that open space lands should be ubiquitous (refer to Objective No. 1). Three examples will serve to illustrate the manner in which the objective has been applied in the ensuing chapters.

(i) Riverside residential districts can be found at a number of locations on lands immediately adjacent to the Elbow River. They are of varying ages and in varying conditions; some are visually attractive whereas others are not. They are a microcosm of the historical evolution of urban land use in this city and have largely determined the character of lands adjacent to that river. In short, they are distinctive. Consequently, recommendations of this plan envisage the retention of these riverside residential communities. Parks are seen as complementary adjoining land uses.

(ii) Lands adjacent to the Bow River in the southeast portion of the city are presently undeveloped to a large extent. Many of these areas are undistinguished, being vacant, low lying and of limited aesthetic significance. In parts, they are unsuitable for intensive development because of the potential flooding hazard. Here, recommendations of the Plan envisage landscaping and the creation of trails and other open space recreational facilities. Enhancement is the key with the objective of creating an actively manipulated environment which is distinctive.

(iii) Natural areas presently exist at numerous locations adjacent to the watercourses. They are quiet, aesthetically pleasing and contain a considerable diversity of flora and fauna. Little attention has been paid to such areas in the past, yet they are undoubtedly the most distinctive areas of Calgary's riverine environment. Consequently, a major chapter of the Plan is devoted to these areas in order that they might remain, in future, as distinctive features of the environment whilst creating, wherever possible, enhanced recreational opportunities for present and future Calgarians.

4. TO MINIMIZE LOSS OF LIFE, THREAT TO HEALTH AND TO REDUCE ECONOMIC LOSS BY FLOODING

In terms of safety, health and cost, open space is an ideal land use adjacent to the watercourses. Wherever intensive development takes place, the potential hazard with respect to all three considerations is inevitably increased and rises in direct proportion to the intensity of use and the numbers of people living in such areas. Open space lands can be rapidly evacuated and careful planning with the minimal provision of facilities can reduce the potential threat to users. Most open space lands can be inundated without appreciable impact, cost or threat to life.

B1.1 REGIONAL OPEN SPACE

B1.1.1 PURPOSE

The purpose of this chapter is to ensure the provision of sufficient and diverse regional open space facilities in the river/creek valleys to cater to the outdoor

recreational aspirations of present and future Calgarians. Two major components of the public open space system, public access and natural areas, require considerable attention and are discussed in separate chapters.

Existing policies affecting open space lands within the city are listed and concerns and observations expressed by the public are discussed. The need for waterside public open space is established and the desirability for providing for this type of use is discussed. An overview of the literature pertaining to regional municipal open space is presented. This explores the desirability of providing public open space lands and gives examples of facilities and policies which have been established and adopted in other cities. Various alternative open space systems are identified and the existing system is examined. Objectives are established and discussions and recommendations are made relating to the provision of open space and associated facilities.

B1.1.2 EXISTING POLICIES AND STATUTORY REQUIREMENTS

Statutes and policies currently in effect which are related to the provision of public open space lands in Calgary are as follows.

B1.1.2.1 Subject to certain requirements, The Planning Act, 1977 provides for the creation of municipal and/or school reserves at the time of subdivision. Such lands are not to exceed 10% of the subdivided land (Section 96). Respecting the use of such lands the Act states:

> "Municipal reserve or school reserve or municipal and school reserve may only be used by a council or a school authority or by them jointly for all or any of the following purposes:
>
> (a) a public park, or
> (b) a public recreation area, or
> (c) school purposes, or
> (d) to separate areas of land that are used for different purposes."
> (Section 107, [2])

Regulations pertaining to reserve lands are covered in Sections 94-115 of the Act. Additionally, The Planning Act, 1977 provides for the dedication of certain lands as non-creditable Environmental Reserve (refer to Section B1.3.5.1).

B1.1.2.2 The Calgary General Municipal Plan (1979) contains a number of policies relevant to the provision and use of open space in the river/creek valleys:

> "PR.5 Retain and expand the existing major parks system, preserving ownership of all City land suitable for parks purposes, and acquire further suitable lands as opportunities arise.
>
> PR.7 Dedicate all land intended for exclusive use for parks and recreation activities as park land.
>
> PR.8 Ensure that the major physical features making up the park land system are made accessible and usable for varied activities."
> (Section 3.6.16)

"PR.13 Develop the river valleys as a parkland system which includes:

i) continuous public access to all riverbanks,
ii) public walk/bikeways throughout the city,
iii) adequate recreational facilities in appropriate locations,
iv) reduction of air, water, noise and visual pollution,
v) preservation of important major natural features which contribute to the value of the system.

PR.14 Setback zones of 200 feet to be established for any new development, or redevelopment, along the banks of the Bow River.

PR.15 Setback zones of 100 feet be established for any new development, or redevelopment, along the banks of the Elbow River.

PR.16 Acquire major open space and natural areas, as part of the development of a total park and recreation network, in association with the Provincial Government.

PR.17 Preserve undeveloped major escarpments as natural open space features to enhance the environment.

PR.18 Setback zones of 60 feet from the top of the escarpment be established in any new development or redevelopment areas." (Section 3.6.24).

"PR.22 Use existing recreational facilities to the optimum potential by greater intensity of use, good design and programming.

PR.26 Improve parks and recreation facilities in parts of the city that are relatively underprovided.

PR.27 Community facilities should be related to each other to improve accessibility and to provide for greater and safer use." (Section 3.6.34).

B1.1.2.3 The Calgary Bow River Study Committee Report, dated January 1974, (amended and approved by City Council in June 1974) recommended that:

"Undeveloped Lands Adjacent to the Bow River

1. All undeveloped public land within the flood plain of the Bow River in the City of Calgary be designated as parkland.

2. The City place a high priority on implementing its proposal for developing "The River Valleys as an open space system."(1) Immediate attention should be given to those stretches of the river where adjacent land is currently undeveloped. In addition, an expanded system of access to the river must be implemented.

3. An adequate strip of land, not less than 200 feet, adjacent to the river banks be acquired, reserved or restricted in use by the City as soon as possible for public use and for protection of the rivers natural environment. The City of Calgary should prepare an inventory of these land areas and establish priorities for acquisition.

4. A variety of park settings ranging from natural areas to manicured urban parks, be established along the Bow River.

5. All future development in currently undeveloped reaches of the river be compatible with a riverbank area that is susceptible to flooding. Uses such as public golf courses, picnic grounds and recreational areas should be encouraged.

Incompatible Riverbank Uses

The Province and the City embark on a cleanup and beautification campaign of the river and its adjacent banks." (Pages 5 - 7)

B1.1.2.4 The Parks/Recreation Departments "Policy Statement and Planning Recommendations" report (approved by City Council 1976) contains the following recommendations:

"The following are the recommendations made by the Department in regard to the entire river park system, in order of priority.

OS1. Setback zones of 200 feet be established between riverbanks and any new or redevelopment.

OS2. Setback zones of 60 feet from the top of any escarpment be established in any new or redevelopment areas.

OS5. Water trails be designated along the Bow and Elbow with boat launching facilities, portages and picnic sites developed.

OS11. The development of major Bow River System park nodes such as Bowmont, Lowery Gardens, Prince's Island (east), Beaver Dam and Carburn be continued." (Page 3[illegible])

"OS26. Land for golf courses be allocated and purchased when new developments are planned, so that this space is reserved.

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(1) The Calgary Plan (1973)

OS31. Council dedicate all land intended for exclusive use for parks and recreation activities as parkland, and section plans be appropriately designated." (Page 44)

B1.1.3 PUBLIC CONCERNS

B1.1.3.1 The subject of open space in the river/creek valleys received considerable public attention throughout the public participation program. The majority of this input related to natural areas and is discussed in Section B1.3.6. Overall, there was a strong endorsement of the principle of open space lands adjacent to the city's watercourses. People enjoy parks and other forms of open space and feel that waterside areas are appropriate locations for open space land uses. A sizable minority expressed strong reservations with respect to the provision of open space lands in presently developed areas adjacent to the rivers.

B1.1.3.2 Calgary Urban Shorelands Seminar- September, 1978 Questionnaire

Respondents emphasized the importance of preplanning with respect to the acquisition of open space for public use. The importance of taking action in the present to avoid potential conflict in the future was stressed. It was noted that it is relatively easy to acquire adequate open space before development takes place but extremely difficult and costly afterwards. Newly annexed and developing areas were seen as presenting the best opportunities for acquiring open space lands for public use. Almost all respondents saw considerable opportunity to preserve and develop shorelands and water bodies for natural open space and parks.

B1.1.3.3 Public Meetings of November 1978/January 1979 and Open Houses in May/June 1979

Considerable attention was devoted to open space and a wide spectrum of comments were made. The vast majority of citizens expressed positive attitudes towards open space and emphatically endorsed the principle of expansion of public open space in the river/creek valleys. Two concerns regarding the expansion of the existing open space system were often expressed. Firstly, there was concern over the potential implications of a universal provision of open space lands, particularly with respect to the effects on existing riverside residential development. Secondly, there was concern over increasing the potential for all forms of socially unacceptable behaviour by providing new parks. Both concerns are discussed in detail in Sections B1.3.6 and E2.

Many people were concerned that future open space lands should cater to as many recreational activities as possible and that regional parks should be attractive and popular. Bowness and Glenmore Parks were often cited as examples of 'good' parks and a number of people indicated that they regularly travelled across the city to visit these parks.

B1.1.3.4 Open House Questionnaire

Question 1 asked respondents:

"What use or combination of uses would you like to see made of the lands adjacent to the riverbanks in Calgary?"

Respondents were presented with a list of 9 uses and were asked to rank the options in order of preference. Choices ranged from totally undeveloped park to industrial and commercial uses. Parks were mentioned twice as follows:

> "Option (g)
>
> Fully developed parkland with a wide range of recreational facilities (e.g. golf courses, playing fields, picnic areas, etc.)
>
> Option (h)
>
> Parkland with some developed recreational areas and some undeveloped natural setting areas."

When responses were averaged on a scale of 1 to 9 (most frequently preferred to least frequently preferred - refer to Appendix XIII) the above options were ranked fourth and first respectively.

Question 2 asked respondents:

> "Are you in favour of a buffer of land along the banks of the Bow, Elbow, Nose Creek and West Nose Creek, through Calgary?"

Fifty-four percent of the respondents answered 'Yes', 38% 'No' and the remaining 8% were 'Undecided'. A number of people made comments indicating dissatisfaction with the phrasing of this question. The basic problem was that the nature of 'buffer' was not defined. Many people wanted to know what constituted a buffer. The restricted choice of response was also contentious. Most of the respondents who commented on this question indicated that the principle of a buffer of open space land was supported providing that exemptions were made where special circumstances exist, e.g. areas of existing riverside residential development.

Question 5 focused on the provision of recreational facilities on lands adjacent to the rivers. Nineteen examples were listed and respondents were asked to indicate whether or not they would like to see each facility. The majority of respondents wanted hiking trails, cross-country ski trails and botanical gardens. Over 25% of respondents wanted picnic areas and fire pits, children's playgrounds, golf courses and playing fields. Less than 10% wanted trail biking, concession stands, skateboard trails or snowmobiling.

Respondents were invited to make additional comments on the reverse side of the questionnaire. Over 45% of those who made comments referred to open space. The majority of these responses related to natural areas. Of those referring specifically to parks and other types of regional open space, two respondents were opposed to extensions of the existing open space system; one, because of the problems and inconvenience experienced by people living close to parks, and the other because it was felt that the cost of acquisition and maintenance would be too great a burden on the taxpayer.

Examples of other comments are as follows:

> "Fewer buildings and more green belt areas are needed."
>
> Problems with vandalism etc. are related to the fact that there are "not enough parks and recreation areas."

"A stranger comes to Calgary expecting 'wide open spaces'. Think wide. The only place I sense this is Nose Hill."

"Parks are needed for children."

"As the city grows, the green areas provide a break in the urban landscape. The larger the city gets the more important that citizens can and know they can escape the urban landscape."

"I would like to see as much land as possible set aside for public use. Calgary is headed for growth and what may seem adequate today will be insufficient tomorrow."

B1.1.4 THE PROVISION OF WATERSIDE OPEN SPACE - SELECTED EXAMPLES

B1.1.4.1 Linear Park Systems

The concept of linear urban parkways has long captured the imagination of citizens and planners in many areas of North America. The advantages are enormous. Rather than having isolated nodes of recreational activity where the public is confined to rigidly formal spatial units of green space, the linear park permits far greater flexibility and choice. Recreationists can run, cycle, jog and ski between nodes of recreational activity catering to diverse needs without confinement or the hazards involved in continually crossing transportation corridors. In contrast with the standard park perimeter trail, the public can enjoy linear and interconnecting loop trails which offer considerable variety and challenge. The variety of park and trail types which can be contained within a single system are considerable.

The opportunities for the creation of such systems vary considerably depending upon such diverse factors as the availability of finance, topography and the nature and extent of other intervening land uses. Partial systems exist in a number of areas, for example the bayou systems in Houston and the Platte River Greenway in Denver. The Trent River/Rideau Canal system in Ontario is also a good example. In western Canada there is a partial linear park system in Saskatoon. The park system in Regina is a notable example. Edmonton's ravine parks provide one of the finest examples on the continent. Calgary itself has a partial system (open space systems are discussed further in Section B1.1.6.4). The concept of linear park systems is not confined to North America. Cathays Park on the Taff River in Cardiff, Wales is a good European example. Numerous examples of fine linear park systems can be found on the continent. The river Seine in Paris and the river Neckar in Stuttgart are good examples. In Calgary, Fish Creek Provincial Park is the largest of its kind in North America, which permits active and passive recreational activities adjacent to the Bow River.

Over the years the concept of linear park systems has outgrown its purely municipal origins. In rejecting the English green belt philosophy for the containment of urban growth, the French PADOG strategy of 1960 envisioned a sharply axial pattern of growth for Paris, based on the line of the Seine with the riverside itself protected as a giant zone of recreation, stretching downstream towards Rouen. In the U.S. this concept was modified; 'Metro Greenways' became the innovation of the seventies - massive linear park systems in the form of green strips

linking urban areas. Examples are the Delaware Water Gap Recreation Area and the Trinity Greenway which was planned by researchers at the Texas Tech University to link Fort Worth and Dallas.

The above examples are all very distinctive and they vary enormously in scale and character, and in terms of the nature and variety of recreational opportunities offered. Cathays Park has as its centrepiece Cardiff Castle; the Wascana Centre-Regina's Legislature; and the Seine system - the city of Paris. They all have three basic characteristics in common; they are linear park systems, they parallel watercourses, and they enjoy enormous public popularity.

B1.1.4.2 Open Space/Urban Renewal

In recent years, municipal governments have exhibited a marked enthusiasm towards providing public open space in waterside locations. Opponents of rapid urban expansion in the sixties lamented the loss of open space lands and it was almost a truism that once such lands were developed, green space was 'lost' forever. In the seventies, the fallaciousness of this maxim became clear as numerous municipalities embarked upon far reaching programs of urban renewal which sought to rectify community open space deficiencies that had often existed for decades, and to improve the quality of life in decaying areas of the built environment. Often the most disagreeable eyesores of the past became the new parks of the present.

A good early example occurred in the Potteries region of the English Midlands. In the sixties, large areas in Stoke-on-Trent were characterised by urban blight and industrial obsolescence. Subsequently, old wastestrips have been landscaped, planted and transformed into popular parkland. London's River Lea follows a meandering north/south course to its confluence with the Thames east of the Blackwall Tunnel. Large parts of the Lea Valley have long been industrial wasteland. It is hardly a garden paradise today but it does now contain reservoirs, sports grounds, football grounds, playing fields, stadiums, parks and marshes which offer a wide range of recreational opportunities to serve the densely populated northern and eastern parts of that city. Similar examples involving extensive tree plantings on derelict industrial lands have taken place in West Germany (e.g. in Stuttgart, Munich and parts of West Berlin).

In North America the trend has continued. Prompted by an increasingly informed and demanding citizenry, there has grown a new political awareness of the invaluable recreational opportunities which urban waterside lands present. As in Europe, much attention has focused on derelict urban lands and often the process of renewal has been accompanied by water quality enhancement programs. A good example is the Detroit waterfront. Detroit has had river plans since 1948; water quality in the Detroit river has improved remarkably and it was noted in 1974 that the city had acquired 75% of the land necessary for a park access river drive (Moncrief and Canup 1974, Page 69). However, unlike most areas in Europe, many North American municipalities are in the enviable position of possessing waterside lands which have not undergone development. Consequently, there has been a trend to preserve existing open space for public use to provide recreational opportunities, to protect notable areas of the natural environment and to prevent the encroachment of urbanization into waterside locations. A policy of the San Francisco Comprehensive Plan (Recreation and Open Space Section, Page 7, adopted by San Francisco City

Council in May 1973) is to "provide new public parks and recreational facilities along the shoreline" to insure that "the western shoreline remains a long, unbroken stretch of natural open space."

In the spring of 1978, the U.S. Department of the Interior published the National Urban Recreation Study. The study took 18 months to complete and a portion of the project involved field studies in 17 urban areas. During the course of these studies, local residents identified major open space opportunities existing in the waterfront areas of such cities as Chicago, Cleveland, Detroit, Houston, Los Angeles, Milwaukee, New York, Philadelphia and Seattle. A review of the total project by Hall and Rogers (1978) noted:

> "A number of cities, including Boston, Cincinnati, Denver, Detroit, San Antonio and San Francisco have already demonstrated the economic, cultural and recreational values of reclaiming abandoned or derelict waterfront areas."

The amounts and types of open space provided in North American cities exhibits as great a variety as do the cities themselves. In every instance, programs reflect the will and enthusiasm of citizens and recognize contraints imposed by the existing urban form. Another common feature is that diversity of types of open space is considered to be a desirable goal. For example, an objective of the San Francisco Comprehensive Plan (Recreation and Open Space Section, Page 13) is to "Develop a diversified and balanced system of citywide recreation and open space". Ensuing discussion notes that "All parts of the citywide system should supplement each other by providing a wide choice in recreational activities".

B1.1.4.3 Waterside Open Space - Selected Case Studies

The following examples are provided in itemized form to illustrate the range of recreational facilities which have been provided by various North American municipalities.

(i) San Antonio: In a unique scheme, riverside lands have been retained as public open space in a very intimate, busy urban setting which mixes parks with business activity. The San Antonio River is a relatively small river with a mean annual flow of 57.9 cu. ft./sec. and a width of 30 to 50 feet (9 - 15 m). The river lies 25 to 30 feet (8 - 9 m) below street level and has retaining walls but a natural bed. A secondary objective which has accompanied development of the system has also been to achieve flood control.

The developed portion of the system in the downtown core is known as the 'River Walk'. Sightseeing barges and pedal boats are allowed on the river. Reed (1976, Page 29) notes:

> "Development over the years has produced a navigable river bounded by tree-covered walkways, grass, and a variety of other plant materials; arched foot bridges; street-level entranceways; boat landings; street furniture; and renovated buildings. Today, hotels, night clubs, sidewalk cafes, an outdoor river theater, craft and gift shops, and art galleries provide opportunities for a variety of

recreational pursuits, all within an environmental setting enhanced by architecture, landscaping, night lighting and cultural events. Tourism generates almost $100 million for the city. Over 4 million visits are made to the River Walk annually."

(ii) Rapid City: Rapid City, South Dakota, possesses a comprehensive open space system about 4 blocks wide on either side of the Rapid Creek. The system contains a considerable variety of parks and recreational facilities, is immensely popular with local residents and is a good tourist attraction.

Creation of the system was instigated as the result of a tragic event. Rapid Creek rises in the Black Hills National Forest. In 1971, a freak storm created severe flooding. The city was devastated, millions of dollars of damage ensued and many lives were lost. This example is discussed in more detail in Section B2.1.5.

(iii) Boston: Many of Boston's parks are concentrated in waterfront locations. A plan prepared for the Boston Redevelopment Authority (Boston-Urban Wilds, 1977), envisions the creation of a series of natural parks and sites, many of which have waterside locations and complement the existing park system in such areas as the seafront and along the Neponset River and Mother Brook.

(iv) Lansing: In Michigan, Lansing's Riverfront Park provides a good example of recently reclaimed waterside open space. The park covers some 1.5 linear miles (2.4 km) on either side of the Grand River. A project of the City's Housing and Redevelopment Corporation, the park cost approximately $3.6 million. The site previously consisted of railroad freight yards and decrepit warehouses. The area was completely relandscaped utilizing some 30,000 cubic yards of fill and is linked to other city parks through the North Lansing Historic District. Park facilities include playing fields, tennis courts, biking trails, a river walk, a riverside viewing stand, docking areas and two ampitheatres. Surrounding land uses include extensive parking areas, the City Market and proposed sites for future office and high density housing development. (McCloud 1978, Page 26).

(v) Vancouver: In recent years increasing attention has been paid to the recreational opportunities offered by Vancouver's extensive waterfront. The famous Stanley Park may be considered as the 'hub' of Vancouver's park system, but other open space areas exist at English Bay, along the shoreline between Kitsilano and Point Grey and at the West Vancouver beaches. Other existing and proposed open space areas include the Boundary Bay shoreline, Burrard Inlet, Home Sound and the Fraser River and delta.

(vi) Edmonton: The open space system in Edmonton's North Saskatchewan River valley is arguably the most comprehensive development of its type on the continent. Edmonton was aided by fortunate topography in the form of a well-defined and steep gorge, which restricted other types of development, and considerable Provincial aid. Notable is the Capital City Recreation Park, created at a cost of $45 million paid for largely out of the Heritage Trust Fund and comprising several thousand acres of parkland stretching along 9 miles (14.4 km) of the river's banks. The park was opened in time for the Commonwealth Games in July 1978. Facilities include

a golf course, a ski hill, snowshoeing and cross-country skiing areas, scenic overlooks, lakes, picnic areas and a pavilion for sports and cultural activities.

(vii) Denver: Of the examples cited, that of Denver is probably the most germaine to Calgary's situation. Like Calgary, Denver is situated on the high western plains close to the Rocky Mountains. It is growing rapidly and is a centre for the oil industry. It has approximately twice Calgary's population but is of comparable physical size. Like Calgary, the city has a major river, the Lower Platte, which follows a meandering course through the centre of the city. It has a smaller river, Cherry Creek, which drains a water supply reservoir and has its confluence with the Lower Platte in the downtown area. The city also has a number of small and intermittment watercourses such as Bear Creek, Sanderson Gulch and Lakewood Gulch.

For much of its length throughout the city of Denver, the Lower Platte River Greenway parallels the Lower Platte on both banks. The creeks and the gulches converging onto the Lower Platte River are also a focal point for parkland. Within this system are golf courses, regional parks, various sports facilities and a most extensive system of walkways and bikeways.

B1.1.5 PROVISION OF PUBLIC OPEN SPACE ADJACENT TO WATERBODIES THE NEED & DESIRABILITY (CITY-WIDE/ REGIONAL)

B1.1.5.1 The Need

Water is a natural focus of attraction for recreational activities. It has been estimated that in the U.S. 25% of all outdoor recreation depends directly on the use of water resources (Collins & Tanner 1976, Page 31) and it has been suggested that this figure may rise to as much as 60% in the semi-arid western states (Lavery, 1974). A far greater proportion of all recreational activity is enhanced by the presence of water.

In Alberta, the availability of water bodies where water-oriented recreational activities can take place is quite restricted. The province possesses only 2.2% of Canada's lakes and rivers in terms of surface area. The location and distribution of these resources are such that they are generally remote from the centres of population. This is especially true in the southern portion of the province and in the Calgary region. Even where water exists, it is frequently not available for recreational use. The Alberta Land Use Forum (1976) studied 630 lakes in the province and found that only 269 had parts of the shoreline suitable for recreational use. In practice, other factors such as accessibility and ownership limit use even further with the result that the vast majority of water-oriented recreational activities take place at a restricted number of sites.

Compared to many other urban dwellers in Canada, Calgarians have limited opportunities to enjoy day use of water-enhanced recreational sites located within reasonable travelling distance of the city. To the west and south, Lake Minnewanka and the Chain Lakes are both about 115 km (70 miles) from the city limits. To the southwest the Kananaskis Lakes are almost 130 km (80 miles) from the city. To the north, Sylvan Lake is about 160 km (100 miles) away. There are a number of lakes to the east of the city but public access is severely restricted. Use of Chestermere Lake is limited as it is

largely surrounded by cottage development. Both the Bearspaw and Ghost Reservoirs offer exciting recreational opportunities but there is no provision of facilities at present and access is limited.

The situation with respect to rivers is even more restricted. Outside the city there are few areas where public lands abut watercourses although point access to several rivers exists at a number of locations. Recreational activities are generally confined to boating and fishing. To enjoy riverside oriented recreation Calgarians must travel to the National and Provincial Parks or Forest Reserve lands where, with the exception of some campsites, recreation is oriented primarily towards low intensity uses such as hiking and cross-country skiing. There are few opportunities outside the city to enjoy more developed or active forms of recreation such as cycling, games, and skating with the occassional concession stand and plentiful and convenient parking in close proximity to recreational facilities.

Because the attraction of water for recreational purposes is universal and not substitutable, and because alternatives within the Calgary region are very limited, Calgarians must look towards their own resources for the provision of a diverse and exciting range of recreational opportunities. These resources are considerable. Glenmore Reservoir caters to a considerable amount of water-based recreational use. However, the greatest amount of water-oriented recreational activity focuses on the rivers. The Bow River is the largest river draining the east slopes of the Rockies between the North Saskatchewan River and the international border. It passes through the city following an oblique and meandering course through many of the city's most densely populated areas. Residential areas of the city not located near the Bow River are served by the Elbow River and Fish Creek in the southwest and south, and West Nose and Nose Creeks in the north and northeast. Only in the extreme northeast and eastern parts of the city are there major residential communities which are not in close proximity to any of Calgary's watercourses. Not surprisingly, the vast majority of Calgary's major regional parks are located in the river valleys, usually abutting the watercourses.

Notwithstanding the relative proximity of outstanding National Parks and other recreational areas, and the considerable personal affluence and high degree of mobility of Calgarians, an increasing emphasis will be placed on urban regional open space facilities located adjacent to the watercourses. Over 75% of the leisure time of Canadians is spent within city boundaries (Collins and Tanner 1976, Page 31) and over 80% of the population of Alberta is urban based (Alberta Land Use Forum 1976). Planning Department data indicates that Calgary's population grew at a rate of 5.6% from January 1980 to January 1981. Based on medium fertility rate projections the population will just exceed 1 million by the year 2000 AD. Clearly, the need for urban waterside public regional open space is great and growing rapidly. Evidence of this fact can be readily observed at any major regional park at peak use times. For example, on any mild winter Sunday afternoon well upwards of 500 people can be observed ice skating on the Bowness Park lagoon at any one time and during the course of such a day literally thousands of Calgarians use this facility.

B1.1.5.2 Desirability and Opportunities

Public need and demand are not the only reasons why the maximum possible amount of regional open space should be provided adjacent to watercourses. There are other strong and cogent reasons why waterside locations are the obvious

and natural places to provide public open space. These are briefly discussed in itemized form below:

(i) Flooding Hazard:

Lands adjacent to watercourses in the city are subject to occasional inundation. This is especially true of the two rivers. Because of the potential threat to life, health and property it is unwise to permit intensive development in areas subject to a severe flooding hazard. Open space lands contain a minimum of buildings (thereby posing little threat to downstream users in the event that structures are washed away), can be rapidly evacuated and can usually return to their former use within a short period of time following a flooding event. Leaving presently undeveloped flood prone lands in open space use can avoid a host of potential future problems. The sagacity of this course of action is commonly accepted in the U.S. where flood damages amount to millions of dollars annually and few municipalities now permit intensive development in such areas. The vacant lands are frequently utilized for parkland purposes e.g. Minneapolis/St. Paul (McHarg 1971), San Diego (Freilich 1976). The flooding hazard is discussed in detail in Section B2.

(ii) Construction Difficulties:

Low lying lands adjacent to the rivers are often marshy and riverbank erosion can threaten developments. The usually high water table can create severe problems with the excavation and construction of basements and the installation of underground utilities. Usually these obstacles are not insurmountable but they do add considerably to the cost of construction.

(iii) Natural Vegetation:

Calgary's riversides exhibit the greatest diversity and concentration of vegetation to be found in the city. In a climate where trees have very slow growth rates and where the survival rate is often low, this is a great advantage to park planners and park users. Riverside parks look like parks soon after their creation, whereas in other parts of the city the development of a pleasing parkland environment can take years, e.g. Confederation Park and Marlborough Park. Additionally, the wildlife associated with former habitats provides an added bonus to park users.

Woodlands have the additional advantage of being able to absorb a considerable number of people in quite small areas without leading to a user perception of crowding which can soon occur in more open space areas. The ability of woodlands to absorb mass recreation has long been recognized by Scandanavian planners (Richardson, 1970). Dame Sylvia Crowe (Page 6) notes that in woodlands

> "there are more varied walks and changes of scene, more vivid seasonal changes and richness of wildlife, while extremes of heat and cold are modified."

(iv) Economics and Potential Hazards:

The proximity of parkland to residential communities is a bonus. Generally, people like to live close to parks. Where parkland abuts a river, the advantages are considerably increased. This is often reflected in housing prices. Residences located adjacent to

parks almost invariably fetch higher prices than comparable properties located elsewhere. Examples are evident in Calgary.

Conversely, where riverside residential communities are located close to the watercourses but where little intervening public open space remains, the situation can create potential hazards, depending on the characteristics of the river in that location. A good example is in the vicinity of the C.P.R. Twin Bridges in Bowness where residential subdivisions have been created recently. The riverbanks are steep and unstable and the river is deep with strong undercurrents. The area has long been popular with fishermen. Children playing, uncontrolled, in this area, as children inevitably will, are subject to very real danger. The situation is exacerbated by the presence of the C.P.R. bridges which offer a quick and tempting means of gaining access to the opposite riverbank (the 85 Street bridge is 0.5 miles (0.75 km) to the west and the Shouldice Bridge approximately 2 miles (3.5 km) downstream). The C.P.R. right-of-way has always been fenced off and now a new 'chain link' fence parallels the riverbank. Inevitably, holes are continually cut in these fences and the whole situation is patently unsatisfying, aesthetically offensive.

B1.1.5.3 Alternatives and Choice

In conclusion, it is advisable to consider alternatives to the retention of open space lands adjacent to the watercourses. Alternatives to the provision of open space are not necessarily bad alternatives but experience elsewhere tends to indicate that unless a commitment is made to the beautification and enhancement of rivers and adjacent lands, the end product can be rather depressing. For every example cited above (Section B1.1.4) concerning the provision of open space there are numerous examples where rivers and adjacent lands have, quite literally, gone down the drain. The following quotations are abstracted from an article by Moncrief and Canup (1974).

> "The lower part of the Range River, a tributary of the Detroit, was transformed recently in the name of flood control into a concrete - enclosed drainage tube. Rather than make a park of the flood plain, authorities chose to spend more than $40 million to eliminate tree-shaded eddies, wildlife and rippling water. Can the Range River still be called a river? Opponents of the paving project call it a 'sterile ditch', a monument to indifference and expediency."

> "Industry took precedence on the river front at the expense of drinking water and recreation. The Detroit River was not only a natural highway and a source of power; it was also a natural sewer."

> "As millions of Americans flee their cities in search of nature, they leave behind some of the nation's mightiest natural river systems. Conditioned to perceive the urban river as industrial wastewater, many people have lost all thoughts of relaxing on its banks, canoeing its rapids, or pulling fish from its depths."

With or without the provision of open space, it is unlikely that Calgary's rivers will be subject to the abuses described above. The above quotations do, however, raise a fundamental concern. Are urban rivers to be seen as an attraction or a repellant for recreational activity? The final quotation also intimates the problems associated with public attitudes once rivers are generally perceived to be horrendously polluted. In fact, the water quality of the Detroit River has improved considerably in recent years. The same is true of the Thames in London, the Red Cedar River in mid-Michigan (dubbed the 'Red Sewer'), Michigan's Grand River and the Delaware River which borders Pennyslvania and New Jersey. In all cases, authorities have had problems persuading the public that these rivers are now attractive places in which to recreate.

This type of information has important implications for public open space in Calgary's river/creek valleys. It is not enough that rivers/creeks be clean and wholesome. They must always be perceived to be clean and wholesome since a reversal of public perceptions takes a long time. The success of an open space system in the river/creek valleys is dependent upon a general public perception that these are good locations in which to recreate. To date, this was undoubtedly true but attitudes are changing. Pollution of the Bow River has received considerable attention. Certainly water quality in the southeastern part of the city leaves much to be desired. Nose Creek is very badly polluted. As new communities develop in the southeastern part of the city and in north Calgary, will the watercourses be generally perceived as foci for recreational activity or places to avoid?

The position adopted by the Calgary River Valleys Plan is that Calgary's rivers and creeks represent the single most positive recreational asset that the City of Calgary possesses. The watercourses and adjacent lands can be places of enormous civic pride where hundreds of thousands of present and future Calgarians can regularly find refreshment and relief from urban pressures in an exciting and diverse outdoor environment. This objective is attainable. As Calgary experiences a period of rapid growth we clearly stand at a crossroad.

B1.1.6 THE OPEN SPACE SYSTEM: THE CONCEPT, COMPONENTS, ALTERNATIVES & GOALS

B1.1.6.1 Definition

The term 'system' is variously defined as

> "a set or assemblage of things connected, associated or interdependent, so as to form a complex unity" (The Shorter Oxford English Dictionary)

> "group of objects related or interacting so as to form a unity" (Penguin English Dictionary, 2nd Ed.)

Clearly, such broad definitions can embrace a variety of situations according to circumstance and need. With respect to parks and open space, it is possible to claim that a few small, fragmented areas of green space constitute an 'open space system' even though the salient characteristics of a system are noticeably absent. The key concept in discussing a system is that of connectivity. A relationship is implied between essentially individual components in such a manner that they are tied into some overall framework. Hammon et al

(1974, Page 1) note "The term 'system' emphasizes that an overall operational process is under consideration rather than a collection of pieces".

B1.1.6.2 Identification of Components

In order to see how the various elements of an open space system interact it is necessary to identify them. In the city's river/creek valleys there are:

Regional Parks e.g. Bowness Park, Sandy Beach
Althletic Parks e.g. Shouldice Althetic Park, Glenmore Athletic Park
Golf Courses e.g. Shaganappi, Maple Ridge.
Natural Areas e.g. Douglas Fir Escarpment, Inglewood Bird Sanctuary.
Special Parks e.g. the Zoo
Other public open space areas: these range from fairly substantial areas of City-owned land to easements for walkways/pathways.

Looking at these various components it is convenient to identify a broad distinction on the basis of spatial configuration; they may be classified as distinct areal units e.g. Beaver Dam Flats Park, or linear parks e.g. riverside parkland paralleling Memorial Drive and Sifton Boulevard. The former function primarily as objectives, destinations for such recreational pursuits as ice skating, basketball or a family picnic whilst the latter are more specialized and, acting as connectors between the major nodes of recreational activity, cater primarily to space consumptive activities which are not dependent upon large areal units of public open space and include walking, cycling, jogging, and cross-country skiing.

Given the basic distinction between areal units and linear connectors, it is possible to conceptualize a scenario whereby the connectivity implicit in the term system is given fullest expression. An open space system consisting of areal units and linear park connectors and based on the waterways could possess the dual attributes of diversity and complementarity. Numerous alternative recreational opportunities would provide the public with considerable recreational choice and a range of options. Where there is a paucity of public open space or where such areas are fragmented or isolated, any one site may be required to satisfy too many recreational demands. This situation can lead to crowding and use conflicts, a dissatisfied clientele and a rapid resource deterioration. The outstanding advantage of an open space system is that it permits the satisfaction of the multifarious aspirations of a maximum number of recreationists whilst minimizing the potential for 'overload' in any one area.

B1.1.6.3 Open Space Systems - Alternatives

With respect to riverside open space there are three possible configurations of parkland that fulfill the essential requirements necessary to be dubbed 'open space systems.' These are illustrated conceptually in Figure 1 and are discussed below.

(i) The Comprehensive Open Space System: This is characterized by a continuous strip of public land bordering both riverbanks. It may be regarded as the ultimate expression of the open space system. It permits the greatest possible range of options and has the greatest potential for accommodating recreational uses. There is an effectively unlimited potential for the creation of looped trails to facilitate the greatest and most convenient movement of recreationists between all parts of the system.

OPEN SPACE SYSTEMS - ALTERNATIVES

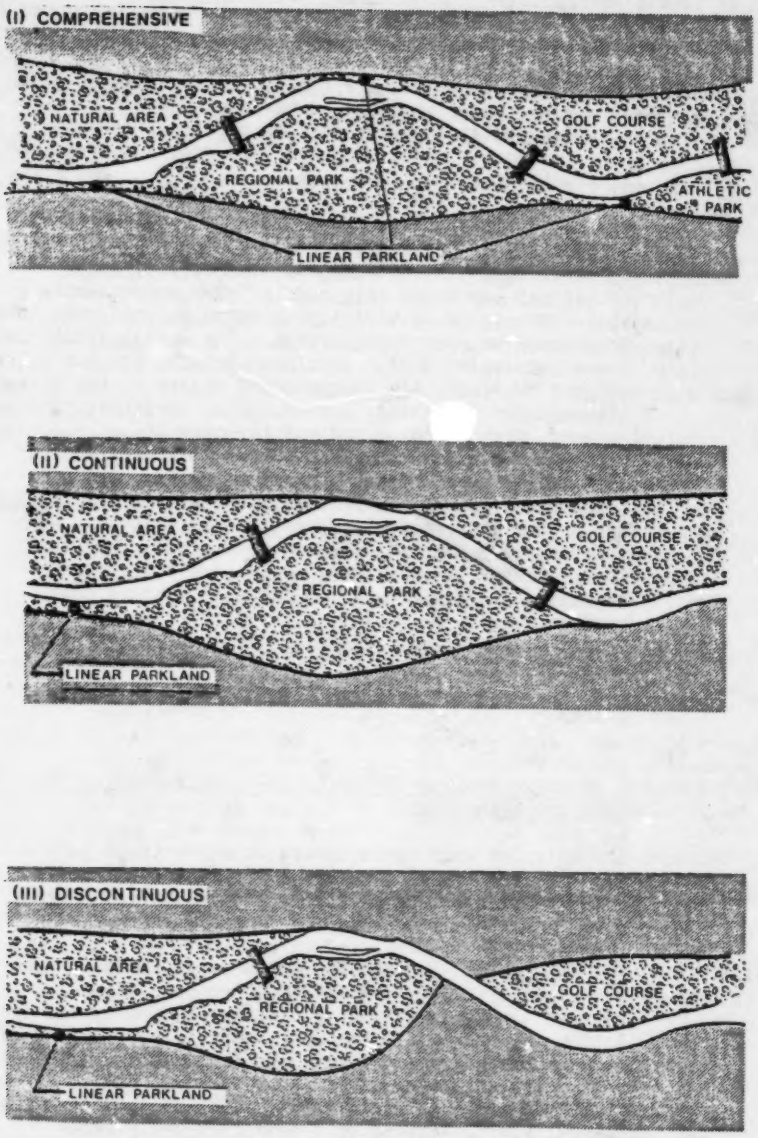


Figure 1

(ii) The Continuous Open Space System: The major units of the open space system are contiguous. Recreationists can move freely from any one part of the system to another and access exists to at least one riverbank at any one point of the system. The potential for the creation of looped trails is more restricted in comparison with the Comprehensive Open Space System. Other land uses abut the watercourses in certain locations.

(iii) The Discontinuous Open Space System: This is the least satisfactory of the alternatives presented from the perspective of optimizing the public recreational potential of the waterways. Some of the major open space components are contiguous whilst others are not. There is a marked tendency towards fragmentation of the system with considerable juxtapositioning of other land uses abutting the watercourses.

The above alternatives are examples indicating basic differences in the characteristics of open space systems in three different situations. In reality, these situations may occur only partially or infrequently as there is a range of variation from no public lands to a comprehensive open space system. The actual situation may lie at any point on the continuum between the two extremes and not be accurately approximated by any of the three alternatives presented. For example, in a city such as Calgary which is large and has a number of watercourses flowing within its boundaries, there may be 12 miles/ 20 km of a comprehensive open space system, yet considering all relevant lands within the city, the total system may still be predominantly discontinuous. The alternative scenarios outlined have a dual function. Firstly, they serve as benchmarks facilitating an approximate judgement of the types of systems that presently exist by acting as points of reference. Secondly, they act as examples illustrating situations which are undesirable, to be avoided if possible, and situations which are desirable, to be achieved if practical.

B1.1.6.4 Open Space Systems in the River/Creek Valleys - The Existing Situation

The existing open space system adjacent to Calgary's watercourses exhibits marked variation, ranging from comprehensive to non-existent. The rivers and creeks are discussed individually below.

B1.1.6.4.1 The Bow River: The existing open space system of the Bow River contains elements of all three open space alternatives illustrated in Figure 1 and described in Section B1.1.6.3. In the most westerly part of the city, the system is primarily continuous. Bowness Park on the right bank connects with Bowmont Park via the 85 Street N.W. bridge. Shouldice Athletic Park is located close to Bowmont Park. A strip of linear parkland extends eastwards from Shouldice Athletic Park to the Boothman pedestrian bridge leading to Edworthy Park. There are a number of minor breaks in this system - major roads have to be crossed, not all lands in Bowmont Park are presently in public ownership, and private lands abut the river in the southeast portion of Bowmont Park and in Shouldice Athletic Park.

Downstream of Edworthy Park, a comprehensive open space system extends to approximately the Cushing Bridge (17 Avenue S.E.). There are several major park nodes: the Douglas Fir Escarpment, Lowery Gardens, the Shaganappi Golf Course, Prince's Island, Fort Calgary, Centenary Park, the Zoo and William Pearce Estate. The majority of the land, however, is in the form of linear parkland of

varying width. Minor breaks exist at a number of locations e.g. there are numerous road crossings; connection across the Elbow River is inconvenient and private lands abut the river in the vicinity of New Street.

Downstream of the Cushing Bridge, the open space system is discontinuous and fragmented. Public lands and park nodes exist at the Inglewood Bird Sanctuary, the old Imperial Oil Refinery, Beaver Dam Flats Park, the Ogden- Millican Escarpment, Carburn Park, south of the Cominco plant, at Queensland Downs and at the extensive Fish Creek Provincial Park. For the most part, however, the system is extremely fragmented, reflecting the presently low levels of population in much of this area. Much of the land abutting the watercourses is in private ownership and is either vacant or in farmland or industrial uses.

B1.1.6.4.2 The Elbow River: Downstream of the Glenmore Dam, a continuous open space system exists as far as the westerly end of Riverdale Avenue. It consists of various publicly owned lands, notably the major park nodes of Sandy Beach, River Park and Riverdale Park. The private Calgary Golf and Country Club dominates the right bank of the Elbow River. Further downstream the system is discontinuous. There are major park and public land nodes at Stanley Park, Elbow Island Park, Lindsay Park and Scotsman's Hill. There are numerous locations where linear parkland abuts the river and the remaining lands are in residential, institutional, commercial and industrial uses.

B1.1.6.4.3 Nose and West Nose Creeks: South of 80 Avenue N.E., a discontinuous open space system exists adjacent to Nose Creek. North of 80 Avenue N.E. no system presently exists adjacent to either of the creeks. Lands are privately owned and generally in farmland use.

B1.1.6.5 Open Space Systems in the River/Creek Valleys - The Goal

The ultimate goal of the Calgary River Valleys Plan is the creation of a comprehensive open space system in the river/creek valleys. It is believed that such a system will permit the fullest and most productive use of scarce and invaluable recreational resources for the greatest public benefit now and in the future. The decision is based upon extensive data collection ('Land Use Inventory and Analysis'), existing policies and statutes (Sections B1.1.2 and B1.3.5), considerable public input (Section B1.1.3), the sparsity of water resources in southern Alberta, the outstanding success and popularity of linear park systems in other cities (Section B1.1.4), and a clear and rapidly growing public need for water-oriented public recreational facilities discussed in Section B1.1.5.

It should be noted that the creation of a comprehensive open space system is very definitely a long term proposition, although the major components of the system can probably be in place within a decade. Indeed, the immediate plan proposals will not, of themselves, result in the establishment of the entire system. Final implementation is contingent upon further study and public input since serious concerns exist regarding the creation of public access in areas of riparian residential development. This situation applies only to certain linear connections in the system and is discussed in Section B1.2. This chapter is concerned only with the major components of the open space system, with the exception of recommendations concerning natural areas which are included in Section B1.3.

In accordance with the Plan objectives, the guiding principle, the overall goal and good planning principles, the plan recommends implementation of only those parts of the system which are desirable, practical, equitable and realistic.

The achievement of a comprehensive open space system will not preclude the existence of a diversity of land uses other than public open space on lands adjacent to the city's watercourses. It will entail that in all instances, lands immediately abutting the watercourses are available for public use for the enjoyment of all citizens. Access to riverside lands would only be restricted or disallowed for ecological reasons, as for example to protect rare and fragile species or sensitive waterfowl nesting areas. The amount of land available for public use would exhibit marked variation, according to local circumstances. The width of the present open space system varies from as little as 6 to 9 m (20-30 ft.), e.g. adjacent to Bow Trail west of the Mewata Bridge to as much as 1.5 km (0.9 miles) in Edworthy Park.

B1.1.6.6 Parks for the People

B1.1.6.6.1 In proposing a comprehensive open space system for Calgary's river/creek valleys, the Plan is sensitive to evolving recreational trends. It is particularly important that the location, extent and design of parks be sensitive to the dynamics of change in attempting to meet the present and future needs and aspirations of Calgarians in a rapidly changing urban environment.

The following remarks have recently been made by Ronald Johnson, an Assistant Professor in the Department of Recreation at the University of Waterloo (Johnson, 1979, Page 4).

> "The majority of urban parks are sterile - throwbacks to a time when their function could be served by landscape styles and facilities fitting a previous clientele. Unfortunately, in many areas the maintenance of the status quo has been the raison d'être of park management. This perseverance in clinging to past models has resulted in a rejection of the park as a reasonable outlet for recreational activity by the majority of todays potential users."

> "If they (parks) fail to adapt to users' needs, they... become obsolete. The failure to recognize this fact has been nurtured by the belief that parks are immutable and irreplaceable... nothing is beyond change; anything may become obsolete... let us look at the following illustration used by Theodore Levitt* to explain how successful institutions may become outmoded:

> > "The railroads did not stop growing because the need for passengers and freight transportation declined. That grew. The railroads are in trouble today not because the

*Harvard Business Review, July-August 1960.

> need was filled by others (cars, trucks, airplanes, even telephones), but because it was not filled by the railroads themselves. They let others take customers away from them because they assumed themselves to be in the railroad business rather than the transportation business. The reason they defined their industry wrong was because they were railroad oriented instead of transportation oriented; they were product oriented instead of consumer oriented."

> "Parks are not merely in the park business, parks are in the people business."

> "...our parks remain basically uninviting, lacking imagination and appeal. They perpetuate the concept of 'parks' but do not fulfill the concept of serving people. To effectively serve the people, it is necessary to understand the wants and needs, preferences and dislikes of the population supposedly being served. Once human needs are related to park development, then parks will rise above obsolescence."

The above remarks constitute a rather scathing attack upon the viability of present urban parks. The comments should not be taken too literally as, like all generalizations, they cannot be universally valid. However, the basic message is certainly applicable to the Calgary situation; namely, that parks must be responsive to people or face the alternative of obsolescence. This is an issue which the Plan addresses specifically as illustrated by the following itemized discussion of peoples requirements as listed by Johnson.

B1.1.6.6.2 Needs: - People need parkland. Leisure time is increasing, the city's population is rapidly expanding and new communities are becoming established close to Calgary's watercourses, e.g. Silver Springs, Millican - Ogden, planned communities in Calgary North, Riverbend and McKenzie. Calgary has a young population with a high proportion of children who have considerable demands for park space. This is particularly true of new communities. If recreational aspirations are not satisfied by parkland, people look for substitutes and this can include T.V., bars, 'cruising' and, particularly among the young, mischief.

B1.1.6.6.3 Wants: - There is a noticeable trend towards space consumptive active leisure pursuits such as jogging, cycling and cross-country skiing which can be best met by the provision of linear parkland. It is also evident that people want variety in their leisure time; they want quiet, solitary natural areas but they also want family picnics areas. They want the freedom to indulge in such individualistic activities as fishing, ice skating and jogging but also more organized pursuits such as golf, baseball and soccer. They do not want isolated and fragmented units of parkland in which all of the foregoing have somehow to be reconciled. They certainly want a variety of parkland types and facilities which are easily accessible and conveniently located within reasonable distance of their homes. They do not, by preference, want

to travel to Banff and spend several hours hiking every time they feel the need to 'get away from it all' and they do not want to drive across town in heavy traffic to enjoy a baseball game. They do view riverine lands as a natural focus for recreational activities.

B1.1.6.6.4 Preferences and Dislikes: - Most people in their leisure activities are quite tolerant of other users and activities but fairly predictable preferences and dislikes do emerge. For example, many people like cross-country skiing but they do not like hikers trampling established ski trails; they like walking but do not like having to leap for the safety of the bushes when a cyclist tears by; they like picnicking but not necessarily in the immediate company of two dozen other families doing the same thing; and they like jogging but do not like having the choice of only one trail every day with the only alternative being city streets with the monotony of counting-off city blocks and the hazards of dodging traffic.

Within a single park, it is effectively impossible to satisfy the varying requirements of the disparate above-mentioned activities and to ensure that the recreational experience is rewarding and satisfying. Inevitably, conflicts arise, the quality of the recreational experience diminishes, dissatisfaction and frustration grows and, when the drawbacks outweigh the rewards, people stop coming to the park and look for other alternative recreational outlets. The clientele changes and the end result is always the same - noisy parties, rowdiness, drag racing, vandalism, locked park gates, night lights and police patrol cars. The legitimate recreational aspirations of the majority are displaced and they become the non-users. The trend towards park obsolescence is established.

B1.1.6.6.5 Whilst a comprehensive park system is not a panacea, the potential for the evolution of the above scenario in such a system is much lessened. In an isolated park, the seeds of obsolescence have been present from the outset. In a comprehensive open space system it is easier to reconcile potential conflicts due simply to the fact that there is not the same intensive demand upon scarce resources. Particular types of use and recreational activities can be separated where they are likely to conflict; different park types can satisfy different recreational aspirations and all can be welded into a mutually complementary whole. The potential for accommodating increased use rises exponentially as at any one time the multifarious users are dispersed throughout the system.

By moving in a positive manner towards the creation of a comprehensive open space system, the Calgary River Valleys Plan seeks to avoid park obsolescence and to ensure that the legitimate recreational aspirations of all Calgarians are well provided now and in the future.

B1.1.7 DISCUSSION

B1.1.7.1 The Bow River

B1.1.7.1.1 Introduction:

The present extent of the open space system adjacent to the Bow River has been outlined in Section B1.1.6.4.1. The major regional open space units discussed below are selected from the Major Environmental Resource Features identified in the 'Land Use Inventory and Analysis,' (Chapter A3). Those sites not discussed in this section do form part of the regional open space system but are of nature conservation significance and are therefore discussed separately in Section B1.3. The remaining lands necessary to complete the comprehensive open space system

are either linear connectors (public walkway/pathways) which are discussed in Section B1.2, or floodway lands which are discussed separately in Section B2.

The major opportunities for the creation of regional open space units on the Bow River are to be found in the southeast part of the city south of the Inglewood Golf Course (e.g. Riverbend and McKenzie areas).

B1.1.7.1.2 Sunnyside Hill and the Ogden-Millican Escarpments

The Sunnyside Hill escarpment extends westwards from the vicinity of Centre Street, paralleling Crescent Road towards S.A.I.T. and Riley Park. The Ogden-Millican escarpment abuts the river and extends along the left bank of the Bow River between Beaver Dam Flats Park and Graves Bridge. Both sites are in public ownership.

Both sites are of minimal nature conservation significance. They receive considerable use, are extensively disturbed and have little potential for the regeneration of high quality natural habitats. However, both are visually prominent features. The Sunnyside Hill escarpment, in particular, dominates the view to the north from the whole downtown area. Extensive trail development has taken place on both sites and Sunnyside Hill is popularly used for tobogganing which has had an adverse effect on the underlying vegetation in a number of areas. Some landscaping has taken place towards the base of the Sunnyside Hill escarpment west of Centre Street. Considerable potential exists for the enhancement of both these sites to improve their appearance as visually prominent open space features to facilitate their use by recreationists.

B1.1.7.1.3 The Side Hill Escarpment and Riverside Area (South of Cominco): City-owned

This site is located on the right bank of the Bow River south of the Cominco plant, north of the Conmac concrete batching operation, and east of the Blackfoot Trail. It will be divided by the Deerfoot Trail extension which will separate the escarpment from the riverside area. The escarpment will in future lie between the Blackfoot and Deerfoot Trails, a visually significant feature containing a variety of habitats but effectively isolated from other components of the open space system. The necessity of providing a new access road from the north to the Conmac property will reduce the size of the riverside portion of the site although a considerable amount of land will remain between the road and the river.

The immediate riverside area which essentially coincides with the floodway is in a fairly natural state, although there has been some clearing of the underbrush. The major natural asset of this area is the presence of numerous waterfowl on the river which stays open during the winter months due to thermal pollution from the Bonnybrook Sewage Treatment Plant. There is also considerable wildlife present since this site is contiguous to the Cominco natural area (refer to Section B1.3.11.1.9). The Carburn Park natural area (refer to Section B1.3.11.1.10) is situated on the opposite bank of the river with two large natural islands just offshore. It is essential that this land be minimally developed for appropriate recreational uses in order to preserve the existing natural habitats.

The open, flat area of floodplain lying between the immediate riverside area and the future alignment of Deerfoot Trail is presently in agricultural use. This land has considerable development potential as a major open space regional recreational facility. Possible future options include a regional park, or athletic facilities such as football and soccer fields, and baseball diamonds. Two sizable lagoons may have the

potential to be developed for ice skating. The most appropriate recreational use of this land should be determined by future detailed site ("master") planning. Vehicular and pedestrian access to the area will be available via Southland Drive.

It should be noted that the industrial Conmac development to the south of this site is an incompatible riverbank use according to the current floodplain management policy of City Council (June 1974, Appendix II). In the event of the future relocation of this operation, expansion of the proposed regional park would permit the development of additional recreational facilities and would expand the open space system allowing connections with the Queensland Downs natural area (refer to Section B1.3.11.1.12) and the proposed regional park on the left bank (C.I.L. land south of Deerfoot Trail).

B1.1.7.1.4 The C.I.L. Land Immediately Adjacent to the Bow River, South of Deerfoot Trail (Land Substantially in the Floodway)

This is an area of riverine flatlands located to the southwest of the C.I.L. plant on C.I.L. land on the left bank of the Bow River. It is immediately south of the future most southerly crossing of Deerfoot Trail over the river and is located opposite to the Queensland Downs escarpment. Located predominantly in the floodway, it is contiguous with a natural area of escarpment and riverine flatlands (refer to Section B1.3.11.1.13) to the south and lies opposite to the most northerly portion of Fish Creek Provincial Park.

Much of the site is covered by well developed Balsam Poplar though most of the understory has been cleared and grazed and portions of the site are disturbed. Consequently, the site is aesthetically attractive but of minimal nature conservation significance. It is an ideal location for a major regional park and there is considerable potential for the development of a wide range of recreational facilities to serve the residents of McKenzie and any other future residential developments that may occur adjacent to this site. Access for other city residents via the new Deerfoot Trail will be excellent.

There are also few areas of the city where floodway lands are so extensive. In addition, considerable portions of the site have no major vegetation thus permitting the development of recreational facilities without the drawback of tree clearance. This site has the potential to become one of the city's most popular riverside parks containing various trails, picnic facilities and possibly sports facilities on the vacant lands situated in the floodplain. The precise future recreational use of this land should be determined by "master planning".

B1.1.7.1.5 The Inside of a Riverine Meander and an Area of Riverine Flatlands (Adjacent to the McKenzie Area): Provincially-owned

These sites are identified separately in the Bow River Environmental Inventory, 'Land Use Inventory and Analysis', Chapter A3. Both are situated below a natural bluff and are largely in, and are linked by, an extensive floodway and are therefore best considered as a unit for the purpose of this chapter.

The site is located on the left bank of the Bow River, opposite Fish Creek Provincial Park and to the north of Highway 22 on land owned by the Daon Development Corporation.

The riverine meander contains a Water Birch community which supports a diversity of species and is of considerable nature conservation significance. The riverine flatlands have some good stands of Balsam Poplar although most of the understory has been grazed and cleared, and some vacant land. The majority of the site is aesthetically attractive but has limited nature conservation significance.

The entire site is located immediately adjacent to the McKenzie area which will support 20,221 persons (McKenzie A.S.P., approved October 23, 1979) and has considerable recreational potential. It is desirable that the existing Water Birch community be preserved and that pedestrian access be provided to and along the riverbank for the benefit of adjacent community residents and other users of the open space system. Existing major vegetation is concentrated in the immediate riverside area and these lands have the potential to support passive and low intensity recreational uses. The remaining major portion of the site, outside the floodway, is probably best suited for use as a public golf course and/or a regional park. Presently, there are only four golf courses adjacent to the Bow River; two are private (Silver Springs and Inglewood) and two are public (Shagannappi and Maple Ridge). There is a clear demand for this type of facility.

It is desirable to provide a pedestrian linkage between this site and the Fish Creek Provincial Park to facilitate the free movement of the local residents of Deer Run and McKenzie between the two parks and to maximize connectivity between components of the overall open space system.

B1.1.7.2 The Elbow River

Lands abutting the Elbow River which are not presently in parkland use have been intensively developed, notably for residential, institutional and commercial land uses. The creation of additional parkland cannot be accomplished without massive land acquisition involving numerous small holdings. Such action would not be practical, equitable or desirable as it would adversely affect the harmony and urban character of riverside lands and neighbourhoods, would involve much imposition upon and inconvenience for present riverside users, and would be prohibitively expensive.

Creation of a comprehensive open space system is a long term goal in this area and focuses entirely upon the eventual acquisition of linear connectors between the major recreational open space nodes. This subject is discussed in detail in Section B1.2. Other regional open space related issues in this area include anti-social behaviour (refer to Section E2), park management and the preservation of existing enclaves of natural environment (refer to Sections B1.3.10.2, B1.3.10.3 and B1.3.12).

B1.1.7.3 Nose and West Nose Creeks

Presently, all lands adjacent to Nose and West Nose Creeks north of the 80 Avenue alignment are privately owned and in open space uses, predominantly agricultural use. South of 80 Avenue, the Nose Creek valley is characterized by industrial uses with considerable outside storage of materials and equipment. There are some parks, a private golf course, and several road crossings. In certain areas, the creek is channelized. The discontinuity of public parkland, the lack of provision of recreational facilities and park maintenance, and the aesthetically undesirable character of much of this valley have long been a concern to the residents of nearby communities. In October 1975, a private consultant, Walker, Newby and

Associates Ltd., produced the "Nose Creek Concept Plan" which was approved by City Council on March 9, 1976. The Concept Plan, amended by the Parks/Recreation Department, was approved by City Council in July 1979. The Parks Recreation Department is now preparing a "master plan" for this area.

North of the 80 Avenue alignment, it is possible to avoid the rather squalid and haphazard development which has characterized the lower Nose Creek valley, while still encouraging the development of a variety of land uses. Future residential development can be expected to occur in the Calgary North area with a projected population of approximately 62,000 people ("Calgary North Policy Report" - approved July 22, 1980). Development of a predominantly residential nature is presently occurring south of West Nose Creek in the Beddington Heights area. The future Beddington Trail will approximately parallel West Nose Creek. New roads serving the planned communities of Calgary North will cross both creeks.

Currently, there are regional open space deficiencies in northeast Calgary. An outstanding opportunity exists in the Nose and West Nose Creek valleys to partially redress existing open space deficiencies and provide a spectrum of recreational opportunities for existing and future residents of adjacent lands. The creeks, associated vegetation and the generally well defined valley sides are aesthetically significant features which act as a natural focus of attraction for recreational activities. Elsewhere in the river valleys, the creation of a comprehensive open space system involves the rationalization of the existing system - integrating major components and moving positively to acquire new parkland in a restricted number of remaining favourable locations. Intensive urban development in the past has imposed stringent practical limitations upon what it is possible to achieve. There are only two exceptions: the Fish Creek valley, where the Province has already acted in a constructive manner to acquire parkland, and the Nose and West Nose Creek valleys in north Calgary where the opportunity still exists.

West Nose Creek contains two important natural areas (refer to Section B1.3.11.3). The escarpments of the Nose Creek valley are also of nature conservation interest and they should be retained in their present form (refer to Section B1.3.10.3). This leaves a small parcel of land adjacent to West Nose Creek at the foot of the major escarpment and a large area of low lying land, both of which are west of 4 Street N.W. as well as the land between the future Beddington Trail and West Nose Creek east of 4 Street N.W. and the entire floor of the Nose Creek valley north of the 80 Avenue alignment.

In the interest of creating diverse land uses to ensure future employment opportunities for local residents and to encourage growth of a diversified industrial economy in the Calgary region, it is desirable that some of this land be set aside for high class restricted light industrial and manufacturing industries. Such development can occur without affecting the integrity of the comprehensive open space system or detracting from the aesthetic qualities of the creek valleys. Accordingly, the land use concept plans indicate a potential employment centre to the north of the West Nose Creek valley east of 4 Street N.W. and desirable locations for possible light industrial uses in the vicinity of 112 Avenue N.W. (the Beddington/Delacour Road).

The land use concept plans indicate a public golf course in the vicinity of the glacial erratic in the Nose Creek valley and a regional park on the north side of West Nose Creek west of 4 Street N.W. Because the nature

conservation significance of the remaining open space lands is negligible, an excellent opportunity exists in both creek valleys to provide a wide variety of active and passive recreational activities ranging from sports facilities to family picnic areas, connected by walkways/pathways and hiking and cross-country ski trails. A number of locations on the escarpments may be suitable for the provision of tobbogan runs. Landscaping will be instrumental in the creation of an attractive parkland environment throughout the whole park system. Future "master planning" is required to determine the most appropriate types of development and facility provision.

B1.1.7.4 The Floodway

The floodway of the Bow River was delineated by the Montreal Engineering Company in its May 1973 report - "City of Calgry Flood Study, Volume 1, Bow River Report". This delineation has been accepted by the City and the Province which requires dedication of all floodway lands as Environmental Reserve at the time of subdivision under the provisions of The Planning Act,1977, Section 95).

Future dedication of floodway lands will be instrumental in the creation of a comprehensive open space system, particularly on the Bow River and specifically in the southeast portion of the city where floodway lands are extensive. This is notably true on both sides of the Bow River, south of the Bonnybrook Sewage Treatment Plant extending as far south as the Queensland Downs escarpment. Regional parks and natural areas are existing or proposed for portions along this reach of the river, but for the remainder floodway lands will play an integral role in achieving full connectivity between the major components of the regional open space system. In some areas, these floodway lands are of comparable width to Bowness Park and have the potential to become regional parks (an eventuality recognized by provisions of The Planning Act, 1977) subject to future demand.

B1.1.7.5 Regional Open Space: "Master Planning"

Recommendations of this chapter (refer to Section C1.1.2.4 of 'The Plan and Policies') have emphasized that the precise type of development at any site be determined by "master plans". It is important to emphasize that such plans do not have an unlimited range of options. As the Calgary River Valleys Plan is concerned with the use, conservation and development of all riverside lands, site planning is neither possible nor desirable within this context. The overall scenario provided by this mandate, however, does provide a perspective to planners concerned with a specific site. Accordingly, the framework established by this plan is, in most instances, quite specific with regard to the status of individual major components of the regional open space system. A basic distinction is made between regional parks, golf courses and natural areas. These various park types are neither interchangeable nor substitutable. The Natural Areas chapter, for example, is quite specific in establishing the parameters within which site development may take place (refer to Section B1.3.11). Extensive facility provision for intensive recreational uses is not a valid alternative for such sites. Similarly, regional parks are not appropriate sites to recreate a complete natural environment and to provide only for passive and low intensity recreational uses.

The various major components of the regional open space system are complementary. They are each intended to provide for certain recreational needs within a broad spectrum of recreational opportunities. The greatest potential for the provision of diverse facilities exists within the regional park category of sites. It is within

this set of sites that provision must be made for the more intensive and organized recreational activities - sports, games, ice skating and possibly fairgrounds and concession stands. As there is very little provision for these types of recreational activities outside the city, these recreational needs can only be satisfied within the urban area.

In the course of preparing future "master plans" for river/creek valley parks, it is imperative, initially, to consider the status of sites as envisioned by this plan and the Parks/Recreation Department's Park Classification System and secondly, to consider how any one area relates to the whole open space system (particularly where the exact status of a site is not specified - as for example in the case of regional open space floodway lands). Within the requirements established by these considerations it is important to make every effort to be sensitive to local community needs and preferences.

B1.1.7.6 Specific Recreation Facilities

Although the Plan is not concerned with "master planning", certain site facilities are important to the open space system as a whole in enhancing awareness of the system and attracting diverse uses. Canoe launching points and lagoons (refer to Section C1) are examples of such facilities. Others are discussed below.

Lands adjacent to the city's watercourses have a wealth of interpretive potential. Some themes of general interest include historical figures, places and events and past uses; natural features; places and objects of geological, historical and geographical significance; wildlife and habitats; plants; the history of parks; and land ownership. In order to focus public awareness on the river/creek valleys this potential should be fully exploited.

In some locations such as Bowmont Park, where a regional park with an interesting history abuts natural areas of considerable significance, it is desirable that interpretive centres be established. Such centres can contain displays and information and fulfill a variety of functions such as promoting community awareness of the rivers and creeks, educational centres for school groups, attractions to visitors and enhancing the cultural life of the city. In other locations, there may be features and past occurrences, for example, of sufficient importance to justify recognition but of insufficient interest to support an interpretive centre. Such sites could be marked with a plaque and be integrated with interpretive trails (refer to Section B1.3.10.9). Locations for interpretive centres and points are indicated on the land use concept plans (refer to 'The Plan and Policies').

Calgary is of sufficient size and its riverside lands of sufficient interest to support a central interpretive facility containing exhibits and information relating to all riverside lands. Such a facility could become a major attraction in the cultural life of the city with presentations of a variety of thematic materials relating to the past, present and future uses of riverside areas and illustrating the historical development of residential lands, parks, and industries for instance. Particular themes might include historical events associated with Calgary's rivers; the role of the rivers as a base for the operations of prehistoric indigenous peoples; the historical development of riverside parks; urban expansion and Calgary's rivers; geomorphological processes associated with Calgary's rivers; Calgary's riverside natural areas, and so on. Such educational programs would probably have considerable public appeal and could draw upon the diverse talents and experiences of numerous

individuals, societies and institutions e.g. the college and university communities, the Calgary Field Naturalists' Society, the Glenbow-Alberta Institute, the Devonian Foundation. Preferred locations for such facilities would include Bowmont Park, Edworthy Park, Fort Calgary and the Inglewood Bird Sanctuary.

B1.1.7.6.1 Public Viewpoints

There are numerous locations in the river/creek valleys where there are panoramic views of the rivers/creeks, adjacent lands, the downtown area, the foothills and mountains. Some of the major locations are indicated on the land use concept plans. At such locations there should be facilities for people to sit and enjoy the views as well as orientation dials to enable identification of especially notable features.

B1.1.7.6.2 Rest Stations

Presently, considerable numbers of recreationists use riverside trails. Where trail systems are well developed, use is particularly heavy and some users travel considerable distances e.g. cycling downtown from the Bearspaw Dam. As the connectivity of the open space system improves and in view of the marked trend towards more strenuous forms of outdoor recreational activities, use of riverside trails can be anticipated to increase in the future. A similar trend of increasing use is noticeable in many of the city's regional parks.

In the event that there is a clear demand for rest stations on regional open space lands, it is preferable that such facilities be conveniently located adjacent to, as opposed to upon, regional open space lands.

B1.1.7.6.3 Group Camping

At present, organized group camping facilities for schools exist in Edworthy Park and the eastern portion of Bowness Park. However, it is not desirable to encourage any form of camping activity other than organized group camping for school children at a restricted number of locations. In concert with new educational/interpretive programs, it may be possible to revitalize organized group camping for the benefit of small supervised groups of school children. If it is not possible to revitalize interest, lands allocated for this type of use would be more appropriately utilized for other parkland uses.

B1.1.7.6.4 Signposting

The present discontinuity of the public open space system leads to considerable confusion amongst users. There is a general lack of clear signposting. It is by no means clear to the average recreationist which lands are public and which are not. As well, there is a complete absence of clear, accurate and informative maps to indicate the location of parks, trails and recreational facilities. Recent innovations such as the installation of kilometre numbered posts on parkland in certain locations is of great use to joggers and cyclists. The availability of good information about Calgary's open space system in the river/creek valleys can accomplish a great deal in encouraging the optimum use of recreational lands and facilities by all citizens.

B1.1.7.7 Acquisition and Cost of Land

Implementation of many of the recommendations made in Section C1.1.2 of 'The Plan and Policies' simply requires adherence to existing and proposed policies. For example:

- lands for the regional riverside park (refer to Section B1.1.7.1.3) are presently owned by the City of Calgary.
- lands qualifying for dedication as Environmental Reserve in accordance with The Planning Act, 1977, can be acquired as and when subdivisions take place e.g. the Nose and West Nose Creek escarpments and Bow River floodway lands in southeast Calgary.

Certain lands in the proposed comprehensive open space system are presently in private ownership and cannot be acquired as Environmental Reserve. Portions of these parcels may be acquired in the form of surplus Municipal Reserve or by density transfer but the majority of such lands will require acquisition by the City. The priorities for acquisition of land for regional open space and the related total estimated cost are included in Tables 3 and 4 of 'The Plan and Policies'.

B1.2 PUBLIC ACCESS

B1.2.1 PRELIMINARY CONCEPT PLANS

During the early part of May 1979, preliminary concept plans were prepared for the Bow and Elbow Rivers, Nose Creek and West Nose Creek. The preliminary concept plans proposed extensions to the existing riverbank walkway/pathway system in accordance with the current policies of City Council. The plans indicated two distinct implementation priorities for the walkway/pathway system:

i) The acquisition of such lands necessary for the implementation of a single continuous city-wide riverbank walkway/pathway system (not necessarily on both riverbanks), and additional access linkages involving large parcels and/or vacant lands were given high priority.

ii) Further development of the walkways/pathways system in those remaining areas of existing riverside residential development where many small owners were affected was given low priority.

B1.2.2 PUBLIC CONCERNS

The above was subject to further review based on public concerns and need. The preliminary concept plans were displayed at the Open Houses held in May/June 1979. In response to the plans, citizens expressed the following concerns related to public walkways/pathways affecting private residential properties abutting the Bow and Elbow Rivers.

B1.2.2.1 Major Concerns:

Vandalism is overwhelmingly perceived as the most serious problem affecting present City parks. Several concerns were expressed regarding the potential for escalation of this problem if public walkways/pathways are constructed between existing private residential developments and the rivers. Citizens stated that if public walkways/pathways through private residential lots were allowed, it would encourage anti-social behavior such as noise, drunkeness, foul language, theft, littering and molesting. In general, the public felt that sufficient law enforcement personnel are not available to cope with vandalism and other crimes along the existing river/creek valleys and that increased public access will further compound this problem. Further, citizens stated that solid waste pollution has increased along creek/riverbanks due to increased public access to those areas.

Concerns were also expressed by the public regarding the City's intention to expropriate privately owned land to construct walkways/pathways and to develop public parks. The riverside residential communities were more concerned about the future of the river/creek valleys and felt that they should receive greater consideration than the public at large with respect to the future management of these valleys. They also feared that the Calgary River Valleys Plan would devalue properties in riverside residential communities. Additionally, it was suggested by citizens that the riverbank properties should include both public and privately owned sections along the rivers. Furthermore, it was noted that there is enough public land along the rivers which the City cannot maintain properly at present. Additionally, the public suggested that there was a need for research on the effectiveness of and the experience with walkways/pathways in other cities (e.g. Baltimore, Denver and Houston).

The problem concerning security, protection and privacy of riverside residential neighbourhoods was emphasized, as it was generally felt that the police could not cope with the existing crime taking place in public parks. Concerns were also expressed regarding the present policy contained in the Calgary General Municipal Plan (1979) which calls for continuous public access to all riverbanks. If such a policy meant access should be created through private residential lots, the public felt that it was a bad policy and should be revoked. Furthermore, it was felt that City planners were not receptive to public concerns. On the other hand, concerns were expressed that private ownership of riverbank land is inappropriate and more riverside park space was needed.

B1.2.2.2 Less Frequently Expressed Public Concerns:

Citizens noted that the lack of continuity in the existing walkway/pathway system made it inconvenient and also that these walkways/pathways should not be routed through natural areas. It was felt that the construction of walkways/pathways causes too much environmental damage. Concern was expressed that some areas adjacent to the rivers may be too dangerous to allow access or it might be too expensive to construct walkways/pathways. It was further stated that, in general, a walkway/pathway through privately owned residential lots shows an extreme lack of respect for private property and embodies the extreme socialist practice of imposing the will of an unaffected majority on a vulnerable minority. It was further mentioned that, at the time of the subdivision of lots, easements have been taken by the City without explanations as to why the easements are needed and/or the stated use for the easement can change without notice to the owner(s) of adjacent land.

Additionally, citizens have expressed concerns regarding the need for wider trails in busy sections of the present trail system (e.g. adjacent to Memorial Drive). It was noted that bicycle paths are needed to link park areas, and that there is a need for separate hiking and equestrian trails. It was mentioned that there should be pedestrian bridges approximately every two kilometres. Suggestions were also made regarding means of securing public access without expropriation of private land, (e.g. at the time of redesignation or when land is sold).

Public concerns are presented in greater detail, in itemized form, in Appendices XVI to XVIII inclusive.

B1.2.2.3 Meeting with Community Groups:

In addition to the foregoing, a brief entitled "The Riverbank Problem-Security, Protection and Privacy for Riverside Residential Neighbourhoods" was submitted by the Rideau/Roxboro Community Association and the Elbow Park Residents' Association on October 15, 1979. On October 18, 1979 a special meeting of the Calgary River Management Advisory Committee was convened to allow representatives from the communities of Bowness, Rideau/Roxboro, Elbow Park and Riverdale to express their concerns directly to the Advisory Committee.

B1.2.2.3.1 In response to the above special meeting of the Calgary River Management Advisory Committee, the City of Calgary Planning Department contacted the City of Baltimore Parks and Recreation Department concerning the effectiveness of and the experience with walkways/pathways in Baltimore. At the above meeting it was stated by citizens that the City of Baltimore, as a result of public concerns, had, in fact, closed public walkways/pathways.

In accordance with a letter dated December 4, 1979 received from the City of Baltimore Parks and Recreation Department, they did not have any information regarding walkway/pathway closures, nor did they believe that this was an area which was causing concern in Baltimore. Furthermore, the City Planning Department contacted the City of Saskatoon, Saskatchewan, Houston in Texas, and Denver in Colorado, U.S.A. concerning walkway/pathway closures which might have been implemented as a result of public concerns. In these cases, the respective Planning, and Parks and Recreation Departments advised that they had no information on record respecting closures of any of their existing riverbank walkways/pathways.

In the City of Saskatoon, walkways/pathways are provided along the riverbanks and public access from the adjacent communities to the river (South Saskatchewan River) is achieved through separate walkways/pathways and vehicular roads. So far, they have not received any complaints related to walkways/pathways along the riverbanks.

With respect to the City of Houston, public access to and along the watercourse (Bayous) is provided where possible. The expansion of their walkway/pathway system is continuing on the basis of opportunities available (e.g. redesignation or resubdivision of riverside land, acquisition of land, or easement agreements). In 1979, the Parks and Recreation Department of the City of Houston constructed about 7 miles (11.2 km) of walkways/ pathways, and an additional 20 miles (32 km) of walkways/pathways were planned for 1980. In certain areas where private residential development exists, no public access is available to or along the banks of the watercourse.

Regarding the City of Denver, the existing open space system including walkways and bikeways is located adjacent and parallel to the Lower Platte River. Most lands adjacent to the river are in industrial use. So far, no major problems have been experienced in acquiring land for public access to the river. Currently, there are about 70 miles (112 km) of walkways/pathways in the City of Denver. The expansion of the existing walkway/pathway network is ongoing.

B1.2.2.3.2 Operations and Development Committee Meeting:

Concerning "The Riverbank Problem-Security, Protection and Privacy for Riverside Residential Neighbourhoods" brief of the Rideau/Roxboro Community Association and the Elbow Park Residents' Association, the Operations and

Development Committee of City Council at their meeting held on December 3, 1979 made and adopted the following recommendation with amendments:

"That the subject Brief be referred to the Administration with instructions to consider these concerns in preparation of the Calgary River Valleys Plan."

Amendments:

1. "That it be clearly understood that as the Calgary River Valleys Plan relates to privately-owned residential property, that Council is given no acquisition directive at this time. Further, that Council will expect the plan to examine every possible alternative to acquisition of residential property before recommending any action towards acquiring lands presently in private ownership.

2. That the Calgary River Valleys Plan outline a program for maintenance and safety control along the pathway systems.

3. That the report from the community be referred to the Police Department for comment regarding the allegations to safety and crime and that the Police Department's comments be brought back to the Standing Policy Committee on Operations and Development."

In accordance with Amendment #3 concerning the allegations to safety and crime resulting from the existing walkways/ pathways along the riverbanks, the following report (City Police Department) and recommendations (Commissioners' Report) were provided to the Operations and Development Committee.

"Riverbanks and parks, particularly in secluded areas, represent special policing problems. The absence of vehicular access makes the job even more difficult because continuous foot patrols of the many miles of riverbanks and parks is simply not practical; and the volume of activity taking place in other parts of the city demands a higher priority in the deployment of police manpower.

Those parks and riverbanks with vehicular access, i.e. Lindsay Park, Stanley Park, Sandy Beach Park, and Glenmore Park, all receive regular routine patrols, while the others are often attended only to investigate specific complaints.

Parks and riverbanks attract their share of undesirables such as sexual deviants and noisy groups of partiers, but many such offences are occurring everywhere else as well. They are not unique to parks and riverbanks.

There are no easy solutions to the parks and riverbanks security problems, but certain measures have been adopted in an effort to curtail them. Numerous liquor and drug offences have been prosecuted as a result of random checks within parks and at entrances and exits. Motorized trail bikes and bicycles are being utilized in areas inaccessible by car. The Mounted Patrol has been formed and is now operational. Zone and District Commanders are meeting with community representatives to discuss mutual problems.

Recommendation:

That the Operations and Development Committee recommend:

1. That Council request the Police Department to meet with the Calgary River Management Advisory Committee to examine this issue in greater detail.

2. That Council instruct the Administration to consider the concerns detailed in the foregoing report in the preparation of the Calgary River Valleys Plan.

Action Recommended:

Approval of the above."

The foregoing report was discussed by the Operations and Development Committee at their meeting held on February 4, 1980. The report was approved and submitted to City Council for their consideration. City Council dealt with the report at its meeting held on February 18 and 19, 1980 and adopted the Operations and Development Committee's recommendations subject to the following amendment:

"That Recommendation No. 2 contained in Clause OD80-10 of the Report of the Standing Policy Committee on Operations and Development, dated 1980 February 4, Re: Calgary River Valleys Plan: "The Riverbank Problem-Security Protection and Privacy for Riverside Residential Neighbourhoods" - Brief, be amended by addition of the following:

"...with particular attention being paid to the location of homes and patio areas as they will relate to public pathways in terms of privacy loss, desirability of fences, etc., to protect against trespassing, window peeping and vandalism, and the legal implications of property rights contained in titles to property."

B1.2.3 DISCUSSION RELATED TO THE RECOMMENDATIONS ADOPTED BY CITY COUNCIL ON FEBRUARY 18 AND 19, 1980

In the case of the Elbow River, there are no separate public rights-of-way for walkways/pathways along the riverbanks which affect the existing private residential properties abutting the river. However, there are two private residential properties (between 24 Avenue S.W. and 25 Avenue S.W.) through which easements have been granted by the property owners to provide a continuous public access to and along the right bank of the Elbow River. With respect to the Bow River, no separate public rights-of-way for walkways/pathways affect the existing private residential properties adjacent to the river. However, it is noted that through a number of residential properties in Bowness, easements for public access to the river have been obtained but no walkway/pathway has been, so far, constructed within those properties because of their isolated locations along the riverbank. The easements for public access were created when subdivision/development ocurred on those private lands, and the applicants were advised accordingly.

B1.2.3.1 Riparian Rights and Ownership of Riverbank Lands:

Concerning riparian rights, the following is a report on the subject prepared by the City Solicitor at the request of City Commissioners. This report, dated January 24, 1980, was forwarded to City Council for information.

"The term "riparian rights" may be generally defined as the rights of every person through whose land a natural watercourse runs to the benefit of the stream or river as it passes through his land for all useful purposes to which it may be applied.

The concept of riparian rights originated in Roman law and was brought into the English common law system by them. Under the Roman concept, the owner of riparian rights owned the river bed and the enjoyment of the benefits of the river to the middle of the stream. Primarily, however, riparian rights were concerned with the use of the water.

The common law concept of riparian rights has been extensively modified, if not completely changed, so that it now seems that riparian rights refer only to use of the water and do not include ownership of the river bed. This is because of Section 4 of The Public Lands Act of Alberta which provides as follows:

4.(1) Subject to subsection (2), the title to the beds and shores of all rivers, streams, watercourses, lakes and other bodies of water is hereby declared to be vested in the Crown in right of Alberta and no grant or certificate or title made or issued before or after the commencement of this Act shall be construed to convey title to such beds or shores.

4.(2) Subsection (1) does not operate:

(a) to affect any grant made before or after the commencement of this Act that specifically conveys by express description the bed or shore or any river, stream, watercourse, lake or other body of water or any certificate or title founded on that grant, or

(b) to affect the rights of a grantee from the Crown or of any person claiming under him, where such rights have been determined by a court before June 18, 1931, or

(c) to affect the title to any land belonging to the Crown in right of Canada.

The Court of Appeal for Alberta had occasion to consider Section 4 of the Act in 1978 in the case of Milk River versus McCombs and Madge. In that case, the Town of Milk River applied to the Court for an order to settle the question of ownership of a portion of the bed of the Milk River. The original grant issued by the Crown in 1901 to the first owner of the land conveyed the whole of quarter section of land through which the river flowed. The Town argued that because of Section 4(2)(a) of the Act, it had ownership of the river bed. The Court held that the retroactive effect of the legislation contained in subsection (1) of Section 4 was valid and that the bed and the shore of the river were public lands belonging to the Crown. The Court found that the Crown's grant had not expressly conveyed the river bed.

In view of the foregoing statutory provision and Court decision, I would think that there would be very few property owners in Alberta who would have riparian rights which give them ownership of the bed or shore of a river. However, they would still have the right to use the water.

I believe that the matter of riparian rights would arise in connection with any proposed system of pathways along the rivers in Calgary insofar as the owners of the land along the river are concerned, only if the pathway denied the owner access to the water. If the pathways are to cross privately owned land, the City would have to deal with the owner to obtain permission to cross his land and, I presume, the owner would insist that the pathway must not interfere with his enjoyment and use of the water.

If the pathway along the river will encroach on the shore, then the City will have to deal with the Provincial Government."

Regarding the present ownership of riverbank lands, title searches at the Provincial Land Titles Office indicate that a majority of the existing private residential properties extend to the edges of the watercourses. It is also noted that in certain cases, along the Bow and Elbow Rivers, land has been added to the private properties either by alluvion or by recession of the water. In accordance with a brief entitled "Natural Boundaries", prepared by the Deputy Attorney General of Alberta, H.J. Wilson, February 5, 1959 in Edmonton,

> "...the new land thus formed belongs to the riparian owner in front of whose land it is formed. ....The converse is also true, that lands gradually encroached upon by the water upon which they border cease to the extent of the encroachment to belong to the former owner"

and revert to the Crown (refer to Appendix III, "Natural Boundaries").

Depths of residential lots abutting the Elbow River range between 125 ft. (38.1 m) to 175 (53.3 m) ft. In Bowness, Montgomery and Inglewood residential lots abutting the Bow River are about 200 ft. (61 m) to 500 ft. (152.4 m) deep. The rear yards of privately owned residential properties have predominantly natural looking vegetation (e.g. trees and shrubs) which is generally well maintained.

In the case of privately owned riverbank residential properties, fences have been mostly erected to but not along the edges of the rivers. The majority of existing single-family homes have their patios and other similar types of outdoor family recreational areas suitably located in relation to the watercourses. Since there are no public riverbank walkways/pathways affecting these properties, the owners enjoy the privacy of their homes as well as excellent views of the adjacent watercourses.

Fences along the existing private properties ajacent to the rivers are of the 'chain link' type which allow unobstructed views of the river corridors. If the fences were of wood or other opaque material it would not be possible for the adjacent owners to enjoy the beauty of such natural assets as the city's watercourses. In addition, wooden fences would no doubt obstruct the overall views of the rivers and adversely affect the general awareness of the river corridors. As the people become increasingly less aware of these corridors, they

will gradually lose perception of the rivers. On the other hand, if the height of such wooden fences is restricted to protect the overall views of the rivers, then the problem regarding the loss of privacy remains unresolved. In view of the foregoing, wooden fences are not desirable for the purpose of separating riverbank walkways/pathways from the existing private riverside residential properties. However, it should be noted that there are two private residential properties located east of the Elbow River between 24 Avenue S.W. and 25 Avenue S.W. through which the City has constructed a public walkway/pathway. The riverbank walkway/pathway was built as a result of an agreement between the landowners and the City of Calgary. At these locations a 'chain link' fence has been erected to separate the riverbank walkway/pathway from the existing private riverside residential properties. According to the City Parks/Recreation Department no complaints have been received from those affected private residential property owners.

In certain cases private residential homes are located quite close to the rivers. As a result, future public walkways/pathways through these residential lots will have impact on the residents' way of life in terms of loss of privacy and loss of space in their gardens. If wooden fences are built to provide separation between riverbank walkways/pathways and the existing private residential properties, there is no possible absolute assurance that the adjacent residents' privacy will be protected completely. Some protection against trespassing or window peeping can possibly be achieved by having wooden fences, but aesthetically such fences can impose a negative impact on the existing natural riverine environment. The problem regarding vandalism to private or public properties cannot possibly be eliminated and is not unique to parks and riverbanks which attract their share of undesirables.

In view of the foregoing, 'chain link' fences may be considered as one of the possible means of separating riverbank walkways/pathways from the existing private riverside residential properties. In order to minimize the 'hard' visual effect, 'chain link' fences can have a green plastic coating or be painted green or any other colour which can 'soften' the physical presence and appearance of such fences. This measure, however, will not provide complete privacy to riverside residents who feel that their normal way of life is threatened by public walkways/pathways adjacent to their properties along the riverbanks. It must be further emphasized that the construction of public walkways/pathways through private properties will reduce the existing depth of private residential lots abutting the rivers. Residential lots which are at least 400 to 500 ft. (122-152.4 m) deep and located adjacent to less moderately steep riverbanks can accommodate a walkway/pathway without any major socio-economic problems. However, permission will have to be obtained from the private owners if riverbank walkways/pathways are to cross their land, and in accordance with the common law concept of riparian rights the owners would presumably insist that the walkways/pathways must not interfere with the enjoyment of their normal way of life and use of the water.

B1.2.4 REVIEW OF EXISTING POLICIES OF CITY COUNCIL RELATED TO RIVERBANK WALKWAYS/PATHWAYS

The existing walkways/pathways along the Bow and Elbow Rivers and their tributaries have been provided in accordance with the following policies of City Council.

B1.2.4.1 Calgary General Municipal Plan (1979):

The River Valley System and Other Natural Areas Policies

3.6.24 "PR.13 Develop the river valleys as a parkland system which includes:

i) continuous public access to all riverbanks,

ii) public walk/bikeways throughout the city,"

The Calgary General Municipal Plan is the overall plan for the City of Calgary. This overall plan provides the framework for detailed planning studies and guides the development of the city. It is a document which looks at the long term growth of the city with respect to what may occur in the next twenty years, and it is legally required under The Planning Act, 1977. Although, more detailed planning studies and the development of the city are dependent on the Calgary Plan, it is believed that there is no commitment to a development of a specific type at a given location in the city at a given time. The general intent of the Calgary Plan is to provide overall guidance in terms of future development of the city. Long term policies embodied in the Plan are based on sound planning principles and these policies should be implemented when it is feasible to do so.

The existing Policy PR.13 contained in the Calgary Plan calls for continuous public access to all riverbanks. However, it should be noted that no time limit is specified for and no commitment is made to such a development within a given time frame. It is a long term policy to serve as a general guideline for future development adjacent to the rivers and creeks in the city. The implementation of this policy depends upon its feasibility in areas where applied. It seems that the policy respecting riverbank walkways/pathways may be implemented only, if and when, suitable opportunities are available.

B1.2.4.2 The City of Calgary Parks/Recreation Department:

"Policy Statement and Planning Recommendations." (June 1976, revised June 1977)

It is a long range objective of the Parks/Recreation Department that:

- "The municipality, through the Parks/Recreation Department, and in cooperation with the Provincial Government, continue to seek control of all river and creek banks to provide public access to the waterways.

- The Department continue to acquire through purchase, lease, agreement, dedication or other means, those parcels of land needed to complete the Bow River System, and wherever feasible, provide a minimum riverbank width of 200 feet.

- The Department continue to acquire by purchase, and other means, continuous riverbank access from Glenmore Reservoir to Fort Calgary, linking the major park nodes, developing new nodes where sufficient land becomes available and providing public riverbank right-of-way along the Elbow River corridor." (Page 38).

Again it is noted that the foregoing are long range objectives of the City Parks/Recreation Department. No specific time limit has been established for the actual contruction of trails. As a long term objective the Department, however, continues to acquire those parcels needed to complete the Bow River System and to provide continuous riverbank access from Glenmore Reservoir to Fort Calgary along the Elbow River.

At this stage, there is no policy that allows for an active land acquisition program with respect to the riverbank walkways/pathways. The present policies allow land acquisitions strictly on an opportunity basis, i.e. (re)subdivision, redesignation and negotiations when private land is formally offered for sale to the City of Calgary. Furthermore, no land has been expropriated for walkways/pathways along the riverbanks.

B1.2.5 RELATIONSHIP TO OBJECTIVES

According to the Plan objectives (#2), the rivers/creeks and valleys should be developed as focal points of year round recreational activities and should promote awareness of the river system as related to the overall development of the city. Presently, there are major public park facilities adjacent to the city's watercourses which function as focal points of year round recreational activities. This is partly due to the fact that good public access to these facilities is available and partly because these recreation nodes are furnished with facilities that are suitable with respect to the need of users. Through these riverside public parks excellent public access is available to and along the adjacent segments of the rivers. In the case of private riverside land, public access is available only when there is an agreement between private land owners and the City of Calgary allowing a walkway/pathway through these private lands. In newly developing areas of the city, access from adjacent residential communities to and along the city's watercourses is secured by creating separate rights-of-way for use by pedestrians and cyclists.

In the absence of public access to the rivers/creeks and along their valleys, recreational facilities built to provide for year round recreational activities will not be freely accessible to the people for their enjoyment. As a result, it will be extremely difficult to promote awareness of the rivers and creeks which are public. Therefore, there is a risk of the public gradually losing perception of the city's watercourses as a viable recreational resource if no adequate access is provided at appropriate locations. It is emphasized that these watercourses are one of the few significant natural assets that Calgarians have and therefore public access is of vital importance.

B1.2.6 REVIEW OF THE EXISTING RIVERBANK WALKWAY/PATHWAY SYSTEMS

The present walkways/pathways adjacent to the Bow and Elbow Rivers form a single continuous system (not necessarily along both banks). As outlined in Section A2, the present walkway/pathway systems adjacent to the Bow and Elbow Rivers include sidewalks on vehicular roads and separate public rights-of-way and easements for pedestrians and cyclists along the riverbanks. There are about 26 miles (42 km) of constructed walkways/pathways adjacent to the Bow River and about 6 miles (9.5 km) along the Elbow River. In the case of steep riverbanks, walkways/pathways are located adjacent to the top-of-the-riverbank line. Final location of riverbank walkways/pathways is normally dependent upon the relative

flatness of the existing topography, and future plans to preserve existing trees and shrubs, and the intent to minimize adverse environmental impact on adjacent land uses.

Although the riverbank walkways/pathways system is continuous, there are areas of concern which should be reviewed.

B1.2.6.1 The Bow River:

As outlined in Section A2.1.4.1 there are no public walkways/pathways crossing the existing private residential properties in Bowness, Montgomery and Inglewood. As a result of subdivision/development on certain properties, easements for public access along the Bow River have been obtained through residential properties in Bowness. No walkways/pathways were actually constructed and, therefore, no access is available at these locations along the riverbanks. However, public access to the Bow River adjacent to Bowness is adequate at this stage.

It is stressed that the Bow River has excellent potential for year round recreation (land and water-based) with respect to its recreational resource capacity and its location in relation to the overall city. Therefore, demand for future public access to or along the Bow River will depend upon any changes in the existing land uses abutting the river (e.g. resubdivision or redesignation of lands) and the future need for regional open space uses adjacent to this river.

The implementation of these high priority proposals will result in a continuous public walkway (not necessarily along both banks) along the Bow River between Bowness Park and Fish Creek Provincial Park. No existing private residential properties are affected by this proposal. Along the remaining segments of the Bow River in the southeast part of the city, extension to the walkway/pathway system is given low priority. However, it is noted that Area Structure Plans for the Riverbend and McKenzie Areas have been approved by City Council (October 23, 1979) and no major problems are anticipated in implementing the extensions to the walkway/pathway system through dedicated Environmental Reserve lands along the riverbanks.

B1.2.6.2 The Elbow River:

With respect to the Elbow River, continuity in the walkway/pathway system is disrupted by roadways and a public golf course located between Glenmore Athletic Park and Glenmore Park to the southwest. Currently, no walkway/pathway link exists between the terminal point of the present riverbank walkway/pathway system located within Glenmore Athletic Park and Glenmore Park. In order to maximize the use of these public parks, provision for a walkway/pathway link must be made on a high priority basis. Construction of this link between the aforementioned major park nodes will involve only City-owned land.

Because of its small size and location adjacent to highly developed areas, the Elbow River has restricted recreational resource capacity at the regional level in relation to the overall city. Therefore, public access to and along the river adjacent to the existing private residential developments is currently adequate. It must be emphasized, however, that future public access to or along the riverbanks abutting the existing private residential developments will be dependent upon any changes in the land use which might occur in the future.

On the other hand, there is an existing policy of the City Parks/Recreation Department to provide trail loops within the existing riverbank walkway/pathway systems. The purpose of creating such loops is to maximize the use of public open space adjacent to the rivers and allow pedestrians flexibility in terms of recreational opportunities e.g. walking a two mile distance on one side of the river and return, walking and experiencing a different environment on the opposite side of the river, to the point of origin or destination.

In relation to the above policy, there are three locations along the Elbow River where trail loops will be needed in the future on a low priority basis, as and when opportunities are available for resubdivision or redevelopment. These locations are: the riverbank abutting Calgary Golf and Country Club golf course; the Roman Catholic Cemetery riverbank land, and the Stampede Grounds riverbank. Because of the current lack of public access to and along the riverbanks adjacent to the above properties, pedestrians must use existing streets which are located on the average, more than 2,500 ft./762 m (0.47 miles/0.75 km) away from the Elbow River. As a result, an effective use of public open space adjacent to the river is not possible. In these three instances there does not seem to be an urgent need for a paved (asphalt or red shale) walkway/pathway. A dirt trail will be adequate to eliminate the current detours in the existing walkway/pathway system along the Elbow River.

B1.2.6.3 Nose and West Nose Creeks

In the case of Nose Creek (north of 80 Avenue N.E.) and West Nose Creek all walkway/pathway proposals are given low priority. It would be appropriate to implement the proposals as and when subdivision of the affected lands in these valleys occurs. Alternatively, the City of Calgary will have to negotiate for the acquisition of lands necessary for the implementation of continuous public walkways/pathways along these creeks. Cost estimates for such lands are included in the total cost estimate for regional open space in the river and creek valleys (refer to Table 4 in 'The Plan and Policies').

B1.2.6.4 CONSTRUCTION AND MAINTENANCE

Most commonly used materials for the pavement of riverbank walkways/pathways are asphalt and red shale. Where appropriate, dirt trails are provided through environmentally sensitive areas in the river valleys. The width of walkways/pathways is normally 8 feet (2.4 m), and in most cases these walkways/pathways are utilized by pedestrians and cyclists. It is noted that the present standard width of walkways/pathways is not sufficient to properly accommodate different types of users at the same time. There is a potential conflict between pedestrians (particularly small children and elderly people) and cyclists using the walkways/pathways. Additionally, there are walkway/pathway sections along the rivers which are located at the top-of-the-dyke (between 10 Street N.W. and Centre Street) built adjacent to the north riverbank. In certain cases, the riverbank is steep and there are no safety measures provided for the protection of pedestrians. On the other hand, there are major transportation corridors located adjacent to dykes along the riverbanks. These dykes have steep slopes abutting major transportation routes. Furthermore, there are sections of riverbank parkland along Memorial Drive which are not wide enough to facilitate a widening of the existing walkways/pathways. In certain cases where the narrow width of existing strips of riverbank parkland is further affected by the steepness of adjacent riverbanks, the walkway/pathway is further moved close to adjacent major transportation corridors, e.g. walkway/pathway sections along Memorial Drive between Edmonton Trail and

Centre Street; 8 Street N.W. to 10 Street N.W. Bridge and 14 Street N.W. Bridge to approximately 21 Street N.W. There are similar problems along the Elbow River where the width of riverbank parkland areas is constricted. These parklands also have steep slopes to the edge of the watercourse and, as a result, it is difficult to accommodate walkways/pathways within those areas.

In addition to the foregoing, it is noted that there are certain sections of riverbanks along the Bow and Elbow Rivers which are affected by erosion, and the safety of adjacent public walkways/pathways is questionable (e.g. the left bank east of 10 Street Bridge on the Bow River, and the right bank north of 25 Avenue S.W. along the Elbow River). At these two locations the riverbank walkways/pathways are being seriously affected by erosion of the adjacent riverbanks.

In view of the foregoing, it is advisable to review the present standard width and the actual location of riverbank walkways/pathways with respect to: different types of users; location of walkways/pathways in relation to steepness of adjacent riverbanks and dykes; proximity to the edges of the rivers/creeks and major transportation corridors; possible separate lanes for pedestrians and cyclists; future use by the mounted police patrol; and type of material used.

B1.2.6.5 CONSTRUCTION AND MAINTENANCE COSTS

According to the City Parks/Recreation Department, the cost of construction of one mile (1.6 km) of walkway/pathway (1981) is approximately $109,000.00 which includes labour, material landscaping and furniture (e.g. benches, signs). Estimated cost of maintaining one mile (1.6 km) of the walkways/pathways per annum is about $3,500.00. However, the Department believes that the current funds are inadequate to properly maintain the riverbank walkways/pathways. It is advisable to sufficiently increase the present allocation of funds to maintain the walkways/pathways properly and to accommodate public concerns regarding the lack of general 'up-keep' of this facility. It will also be advisable to review the environmental impact of the construction of riverbank walkways/pathways on the existing land uses along the city's watercourses.

B1.2.7 Prior to actually providing public access to or along the rivers and creeks, certain basic factors should be established in relation to the city's watercourses such as their present use, location, size, quality and recreational resource potential. Additionally, the status of riparian rights and ownership of the beds of watercourses must also be taken into consideration. It is noted that in accordance with Section 4 of The Public Lands Act of Alberta, the title to the beds and shores of all rivers, streams, watercourses, lakes and other bodies of water are vested in the Crown in right of Alberta. Therefore, with respect to assessment of the need and demand for public access to or along the watercourses, the aforementioned factors can play a major role.

B1.2.8 POSSIBLE WAYS OF OBTAINING PUBLIC ACCESS TO THE CITY WATERCOURSES

In Alberta, the planning approval process has three distinct stages which include subdivision, redesignation and development. Within the framework of each of these stages, the opportunity to secure public access to or along the rivers and creeks is reviewed below.

B1.2.8.1 Subdivision of Land:

In accordance with Section 95 of The Planning Act, 1977,

"...a subdivision approving authority may require the registered owner of a parcel that is the subject of a proposed subdivision to provide part of that parcel as environmental reserve if it consists of...

(d) a strip of land, not less than 6 metres in width, abutting the bed and shore of any lake, river, stream or other body of water for the purpose of

(i) preventing pollution, or

(ii) providing public access to and beside the bed and shore."

In reference to the foregoing, it must be noted that in the case of the city's watercourses it is not usually practical to construct a public walkway/pathway within 20 ft. (6 m) of the river's edge because the existing riverbanks are either steep or unstable. Therefore, land more than 20 ft. (6 m) in width abutting the rivers/creeks may be needed to provide proper and safe public access to and beside the bed and shore of these watercourses.

According to Section 96(1) of The Planning Act, 1977,

"(1) ...a subdivision approving authority may require the registered owner of a parcel that is the subject of a proposed subdivision

(a) to provide part of that parcel as municipal reserve and part as school reserve or as municipal and school reserve, or

(b) to provide money in place of municipal reserve and school reserve or municipal and school reserve or any of them, or

(c) to provide any combination of land or money referred to in clauses (a) and (b).

(2) The aggregate amount of land that may be required to provide under subsection (1) shall not exceed 10 per cent of the area of the parcel less the land required to be provided as environmental reserve."

In view of the above, all or some of the reserve land could be located adjacent to the city's watercourses to provide public access to or along the rivers and creeks. In areas where, as a result of subdivision, reserve is not taken in land, money in lieu of such reserve may be accepted and put into a fund. Monies from this fund could then be utilized to purchase, on an opportunity basis, land adjacent to the rivers/creeks to provide public access. Alternatively, reserves could be deferred against future subdivision of creek/riverbank land belonging to land owner(s) owning land that is the subject of a proposed subdivision occurring away from the rivers/creeks. However, a major problem in this case would be the timing of subdivision of creek/riverbank land which cannot be negotiated with land owner(s) involved.

As a result, public access could not be provided when it is needed because the land owner(s) cannot be forced to subdivide his/their creek/riverbank land as and when the City wishes to create public access along the creek/riverbanks.

However, according to Section 94 of The Planning Act, 1977,

"A subdivision approving authority shall not require the registered owner of a parcel that is the subject of a proposed subdivision to provide reserve land or money in place of municipal reserve or school reserve or municipal and school reserve if

(c) the land to be subdivided is two acres or less,"

Therefore, the above outlined provisions only apply to larger parcels of land such as newly developing areas. These do not apply to resubdivision of small residential lots such as is currently occurring in the Bowness area. While the Subdivision Approving Authority can request the granting of easements for public access in these areas, the Alberta Planning Board will not uphold conditions requiring such easements.

Under The Planning Act, 1977, definition of a public roadway includes a walkway and therefore, it might be possible to take land for a walkway/pathway adjacent to the riverbanks as part of the 30% dedication for roadways. Although this can, and is done on large scale subdivisions, the feasibility of doing so on individual lots when they are resubdivided is questionable. Since these small scale resubdivisions do not normally provide any roadways, the walkway/pathway would not necessarily connect to any other roadways or walkways/pathways. Moreover, such walkways/pathways would not be required to provide access to the property and, although this is not a specific requirement of The Planning Act, 1977, the Alberta Planning Board is of the opinion that only roads required to provide public access should be taken under the 30% provision for public roadways. (Section 93 of The Planning Act, 1977). As there is no clear guidance provided in The Planning Act, 1977, it is necessary to further investigate this option.

B1.2.8.2 Redesignation of Land:

As and when redesignation of land abutting the rivers and creeks is considered by City Council, minimum setbacks for future development from the city's watercourses can be established. Such setbacks will be for buildings from the edges of the rivers/creeks but the land owners/developers cannot be required to provide land or easements for public access to the rivers/creeks. However, by establishing suitable building setbacks, City Council can protect a strip of land adjacent to the rivers/creeks and therefore make subsequent purchase of the creek/riverbank land or easements easier to negotiate.

In reference to building setbacks from the edges of the rivers and creeks, recommendations are included in the Floodplain Management Policy, Section C1.2.1.3 in 'The Plan and Policies'. The building setbacks have been determined on the basis of the location of the floodway limits and the feasibility of allowing redevelopment on existing residential lots abutting/adjacent to the rivers, with the objective of minimizing property damages in the event of a flood.

B1.2.8.3 Development of Land:

At this stage of the planning approval process, the Calgary Planning Commission and the Development Officer cannot require land owner(s) to provide as a part of the development, land or easement(s) for public access to adjacent watercourses. However, they can require that future buildings be set back from the edges of the watercourses a specific distance, thereby facilitating future acquisition of creek/riverbank land or easements for public access.

As mentioned above, building setbacks from the edges of the watercourses have been recommended in relation to floodplain management and these requirements can be incorporated into the Land Use By-law which would then provide a consistent approach applicable to all creek/riverbank land. Under the Land Use By-law these setbacks would apply to permitted as well as discretionary uses and would, therefore, apply to R-1 and R-2 residential areas. It must be noted that, in accordance with The Planning Act, 1977, such building setbacks cannot be required as conditions of subdivision approval. Building setbacks are appropriately related to development and not subdivision of land.

B1.2.8.4 Statutory Plans:

In accordance with The Planning Act, 1977 City Council can establish policies requiring public walkways/pathways along the city's watercourses. Such policies and related implementation procedures can be included in the various Statutory Plans which are adopted by City Council. For example, it can establish the policy of providing such a walkway/pathway in the Calgary General Municipal Plan and in Area Structure Plans, and also establish building setbacks from the edges of the rivers/creeks to protect the land for this purpose. This would then be binding on the Subdivision Approving Authority. In addition, City Council, in adopting Area Redevelopment Plans, could make a public riverbank walkway/pathway a policy of such a plan and, if necessary, exercise the expropriation powers provided under such a plan to secure access to or along the rivers and creeks which are public. The aforementioned Statutory Plans are binding on the Subdivision Approving Authority and Development Appeal Board and, in fact, are binding upon the Development Officer. Thus, if Council establishes building setbacks from the Bow and Elbow Rivers and the Nose and West Nose Creeks in these plans, it is certain that they will be complied with.

B1.3 NATURAL AREAS

B1.3.1 PURPOSE

The purpose of this chapter is to ensure the retention and preservation of existing natural areas as a component of the proposed open space system in Calgary's river and creek valleys. An overview of the literature pertaining to such areas in a municipal context is presented which reviews some of the advantages and disadvantages associated with their retention and gives examples of relevant policies which have been adopted in other cities. Existing policies and proposals affecting natural areas within the city are listed together with concerns and observations expressed by the public. Criteria relating to the value and functioning of natural areas are identified and a procedure for evaluating the criteria is established. Discussion follows and all areas identified as Major Natural Areas are appropriately analysed.

B1.3.2 DEFINITION

'Natural area' is a relative term and one, in an age where there are no completely unaltered ecosystems left in the world, that must be used with some reservation and be clarified according to the context in which it is used. It should also be realized that 'naturalness' is a perceived phenomenon. Conceptions of its meaning vary between individuals; farmland may appear 'natural' to a city dweller.

Given the above constraints, it is generally agreed that truly natural areas exist where there is an absence of significant anthropogenic influences, thereby permitting natural processes to operate essentially as they did according to pristine conditions. Clearly, this prerequisite does not exist in the city where the degree of remaining naturalness is proportionate to the original diversity of ecosystem conditions and the type, intensity, and length of time that man's various influences have been operating.

For the purpose of this study, all of the natural areas identified on the land use concept plans fulfill each of the following conditions:

(i) they are areas of open 'green space' within the city,

(ii) they are predominantly covered with indigenous vegetation such as prairie grassland or riverine forest,

(iii) there is a lack of substantial modification by man,

(iv) they are not in active arable or other farmland use, and

(v) indigenous fauna are present.

The above is a 'working' definition, since perusal of the lands adjacent to the watercourses by means of fieldwork and air photo interpretation readily allows identification of those areas that conform to the above conditions. For the purpose of this chapter, Major Natural Areas selected from sites identified on the Environmental Inventory Maps and the numerous small, fragmented and discontinuous areas discussed in the Bow and Elbow River Environmental Inventories ('Land Use Inventory and Analysis', Sections A3 and B3) are discussed separately.

B1.3.3 PROS AND CONS

B1.3.3.1 Pros

A number of distinct benefits accrue from the retention of natural areas in the urban environment. The most commonly cited are briefly discussed in itemized form below:

1. Aesthetic

Properly retained, natural areas add interest and definition to the urban form whilst aesthetically enhancing the lives of the resident population. The visual attractions of such areas can be enjoyed at an intimate scale or from afar, as when natural areas are coincident with major relief features - the view of the Douglas Fir Escarpment from Memorial Drive, Parkdale and West Hillhurst, and the escarpment north of West Nose Creek from Simon's Valley Road are two obvious examples.

Residential communities frequently develop a strong affinity towards 'their' local natural areas. The attitudes of residents of Queensland Downs to the riverine escarpment to the east of that community or those of the residents of Silver Springs and riparian residents in Bowness towards Bowmont Park are cases in point.

ii. Ecological Processes

Natural areas perform valuable ecological 'work' for the city such as controlling erosion, reducing noise by acting as a buffer, trapping dust, absorbing carbon dioxide and producing oxygen. This is especially true of forested areas. Three additional functions have been itemized by Thomas and DeGraaf (1975, Page 54):

> "a. Urban forests process ozone and SO_2 as well as cooling and filtering the air.
>
> b. Natural communities routinely process animal wastes; concentration of waste (whether dog manure, bird droppings or human excreta) is the urban problem.
>
> c. Marshes and wetlands ... absorb airborne as well as waterborne waste and also provide cooling and habitat."

Whilst natural enclaves within the city undoubtedly have beneficial microclimatic effects, on a larger scale the effects of the above itemized processes can be considerable. The Mexican Federal Government recently declared a 32 km (20 mile) wide 'National Climatic Zone' between Mexico City and the resort of Cuernavara in order to preserve wooded mountains as 'lungs' to filter and purify air currents from the polluted capital. (World Environment Report, 1979, Page 7).

iii. Education

Natural areas are of considerable educational value to the urban populace and can cater to a wide spectrum of educational needs. At the junior and high school levels they can function as outdoor classrooms for project and field work; the rich variety of resource material can provide a refreshing change from the school classroom. Geomorphology, geology, and biology can be studied in living laboratories and a good instructor can engender in his pupils a lasting respect and appreciation for both individual species and natural processes in general. A University of Calgary professor, Valerius Geist, places considerable emphasis on the psychological importance of nature study to the development of the individual:

> "Our neural structures are most sensitive to the kind and frequency of environmental stimulation ... by manipulating external environments we are unwittingly manipulating the size, complexity and function of our neural mechanisms, as well as the competence of individuals so affected ... islands of environments that support a rich plant and animal life ... stimulate persons, rouse curiosity and in the long run help to create a citizenry aware of the values of the land" (Geist 1975, Page 39).

Advanced students are aware that even the smallest natural areas contain a wealth of potential research opportunities. The public at large can derive considerable educational benefit and personal satisfaction from even a casual study of plants, animals and birds. Many people would consider the occasional sighting of a deer in a remote corner of the city to be a particularly notable experience.

iv. Economics

The controversy concerning the effect of green areas on housing values has been discussed in the open space chapter. It is probably true that the presence of a natural area in proximity to an area of residential development is perceived as more desirable by many residents than a manicured regional park, community open space or playground, all of which may have attendant problems of noise and intensive use. In Woodlands, a "new town" north of Houston, Texas, where wildlife considerations were an integral part of the planning process, the presence of wildlife did add significantly to the value and marketability of adjacent residential properties (Leedy et al. 1978, Page 7).

v. Recreation

Natural areas provide the opportunity for the type of recreational activities more traditionally associated with areas remote from the urban environment. The most natural and inaccessible areas provide a haven for naturalists and ornithologists, and areas in which to enjoy solitude and quiet. Hiking, cross-country skiing and fishing are compatible pastimes whilst games, sports, or mechanized types of recreation are generally accepted as incompatible uses. The emphasis is on "re-creation" (Fox 1977, Page 15). The City of Calgary's "Policy for Environmentally Sensitive Areas" notes "Natural areas can be effective in providing temporary escapes from the pressures and tensions created by urban life". (Page 17) A portion of the literature which considers the role of natural areas in fulfilling the metaphysical and spiritual needs of the urban populace is reviewed by Thomas and DeGraaf (1975, Page 50).

vi. 'Givens'

An additional advantage, unrelated to the functions of natural areas but of considerable importance in securing their preservation, is that most such lands are either intrinsically unsuitable for development or development is unwise. According to Maestro (1974, Page 155), these 'givens' include ponds, streams, rivers, marshes and swamps, steep escarpments and lands subject to flooding. Almost all of the areas identified by this study fall into one or more of these categories.

B1.3.3.2 Cons

Problems relating to the use and viability of natural areas are discussed in itemized form below:

i. Disease

Disease is a problem relating primarily to the presence of wildlife. Pathologist Lars Karstaad (1975, Page 69) classifies the diseases of wild animals into three groups:

a. diseases of importance to the wild animals themselves;

b. diseases of importance because they are shared by domestic animals; and

c. diseases of public health importance.

The latter two are of particular concern in heavily populated areas since urban wildlife can carry a wide range of diseases.

Rabies is the most commonly perceived threat and is widely prevalent in parts of eastern Canada, eastern Manitoba, and portions of Saskatchewan. Diseased skunks from Saskatchewan occasionally introduce rabies into Alberta. The generally low incidence of the disease in Alberta can be attributed to strict innoculation regulations for pets crossing international borders and to the highly successful border patrols of the Alberta Department of Agriculture's Pest Control Office. Rabies does occur in migratory bats in this province and the disease can be transmitted to non-migratory bats which are found in some areas of the city (such as the Inglewood Bird Sanctuary and Glenmore Park).

Due to a fortunate existence of climatic and other factors many disease vectors either do not occur or have limited or sporadic distributions within the province. For example, Alberta has virtually no rats and few ectoparasites. The Wood Tick, however, does commonly occur in wildlife. It is most frequently introduced into the city after having been picked up by humans and their pets when camping in back country brush or scrub. It also occurs amongst the city's gopher population and is a vector of Q fever.

Whilst the potential for disease transmission must always exist, it is certainly very low in urban Alberta. According to Dr. E. J. Young, Regional Veterinarian for the Health and Animals Branch, Canada Department of Agriculture, the risks of the urban population being affected by disease due to the presence of wildlife in the City of Calgary are so minimal as to be negligible.

ii. Potential Hazards

Wherever vegetated areas exist there is a potential hazard particularly for children and adolescents. Scratches and stings, tree climbing, eating wild berries and fungi are all hazardous to a greater or lesser degree.

With respect to wildlife, birds can fly through windows, squirrels can short out power lines and any animal crossing a road creates the potential for traffic accidents. The potential for serious traffic accidents increases in direct proportion to the size of the animal involved. To date, there have been a number of incidents involving deer in the City of Calgary.

Problems with noxious weeds and the potential fire hazard posed by vegetation lead many authorities to develop control regulations. In Alberta, The Weed Control Act (Statutes of Alberta 1972, Chapter 96) provides for the control of various plants. The City's Weeds, Grasses and Plants By-law No. 8766 (Appendix XII), Section 2(f), defines plants as including "any vegetation which is of an objectionable or unsightly nature, forms a nuisance

or a fire hazard, or is not controlled." If applied indiscriminately, existing regulations could have an adverse effect on natural areas within the city.

iii. Economics

Considerations involved include the cost of not realizing the development potential of such sites that are not 'givens' and the cost of managing natural areas which is variable, dependent upon the type and intensity of management required.

iv. Urbanization

Urbanization continually poses a direct and indirect threat to natural areas. This is a factor of considerable importance in Calgary where the rate of development is rapid. On-site development and intensive recreational use destroy habitats, communities and the diversity of species. Urban wetlands are subject to pollution and watercourses carry increased siltation loads which adversely affect many forms of aquatic life. Other deleterious effects result from the use of pesticides and the modification of natural drainage channels.

The existence of transportation corridors through natural areas can seriously impede the free movement of wildlife. Oxley et al. (1974, Page 56) have shown that divided highways with clearances of ± 90 m (98 yards) or more, may be barriers as effective to the dispersal of small forest mammals as bodies of water twice that width.

v. Perceptions

The extremely variable nature of individual preferences towards wildlife creates practical problems when attempting to assess the value of natural areas (refer to Section B1.3.7.3, iv.b).

Polarity of attitudes is influenced by the presence of wildlife as opposed to vegetation. If an individual regards animals as disease-ridden creatures that are likely to bite and chase, it matters little whether this is, in fact, the case. Such a problem may exist locally when animals capable of effective defense, such as badgers or beavers, have been severely harassed with the result that they become aggressive when contact with humans occurs.

Changes in the behavioural characteristics of wildlife due to contact with humans have received considerable attention. Unfortunately, the number of species for which research has been conducted is rather limited and varying viewpoints have been presented concerning the desirability of allowing behavioural modification to take place.

B1.3.3.3 From the above, it would appear that the advantages of retaining urban natural areas clearly have more substance than the related disadvantages. Leedy et al. state:

> "The best way of avoiding problems with urban wildlife is, when possible, to prevent the conflicts through correct planning" (1978, Page 10)

The relative scarcity of urban natural areas makes their preservation even more desirable. Over a decade ago, Stearns (1967, Page 68) observed:

> "There seems little disagreement that the time is long overdue to consider wildlife in the urban environment."

The irreplaceability of existing natural areas is also a consideration. Fox (1977, Page 15) notes:

> "The wilderness we have now is all that we or any men will ever have."

He was not referring to urban wildlands but the point is well taken nonetheless.

Pressures associated with recreational use rise in inverse proportion to the number of areas remaining, a factor which severely compromises the feasibility of preservation. In order that the urban populace might accrue maximum benefits from natural areas and their associated wildlife it is necessary to establish and maintain the greatest possible diversity of viable habitats.

In general, problems with urban natural areas relate more to viability than desirability. For the most part, this problem can only be addressed in detail on a site specific basis (refer to Section B1.3.10.4). However, a number of factors which may reduce the viability of urban natural areas are discussed in Section B1.3.7.4.

B1.3.4 PLANNING FOR PRESERVATION - SELECTED EXAMPLES

B1.3.4.1 A basic biological maxim is that the stability of an ecosystem is directly proportional to its diversity. The rule is universal and is applicable to the urban situation (Leedy et al. 1978, Page 5). Given, therefore, that there is a mutual interdependence between both flora and fauna within a natural area, something of a symbiotic relationship exists between those various professions (wildlife management, ecology, planning, forestry, and landscape architecture) which have legitimate interests in the various components of natural ecosystems. Within this complex of areas of mutual concern, the planner has a key role in identifying and evaluating the specialized contributions of the relevant fields of study with respect to potential policy and land use considerations that have planning implications. Leedy et al. (1978, Page 5) state:

> "It is becoming more and more evident that regional and site planners will have an increasingly important role in the preservation of our wildlife heritage."

Traditionally, planners have failed to adequately consider biophysical resources. Increasingly, this is being recognized within the profession as a limitation of serious concern. There are indications within Canada that a significant change in attitudes is, in fact, occurring. Following an overview of environmental programs concerning urban areas at the municipal, regional, provincial and federal government levels, Neville Ward of the Federal Land Directorate notes "The emphasis appears to be shifting from land as a commodity to land as a natural resource" (Ward 1977, Page 5).

In the early years of this century, North American attitudes towards environmental protection in urban areas were guided by the pioneering efforts of the Olmsted brothers. Emphasis was on the preservation of green areas for their aesthetic value. Later, particularly during the period of economic expansion following the Second World War, the protection of environmentally sensitive areas as a component of the urban design process received little

attention. However, in the last ten years or so, associated with a rising public environmental awareness, planning has increasingly reflected environmental considerations.

Concerns relating to all aspects of the quality of our environment have continued to increase with the retention of natural areas assuming high priority in the public consciousness. Within the constraints of developability, economics, and the necessity of maintaining a viable city infrastructure, the desirability of preserving such areas within cities is now generally recognized.

Itemized below is a brief, selective overview of plans and policies proposed and adopted at both regional and municipal levels of government in Canada, the Britain, and the United States.

B1.3.4.2 Canada

The Regional Municipality of Waterloo, Ontario has designated environmentally sensitive areas for inclusion in its official plan; 69 environmentally sensitive areas were selected which cover an area of about 6% of the municipality (Stagg 1976, Page 29).

Since passing its Ecological Reserves Act in 1972, British Columbia has established over 62 ecological reserves ranging in size from 1.5 to 24,300 acres (Foster 1976, Page 29).

In Edmonton, efforts have been made for over seventy years to preserve existing natural areas in the North Saskatchewan River valley. The process began in 1907 when F. G. Todd, a landscape architect from Montreal, produced a comprehensive plan for parks and boulevards in Edmonton. He recommended that areas of great natural beauty, such as the river valley ravines, be withdrawn for parks purposes. His recommendation was accepted and adopted in the 1915 City Plan (Pearson 1974, Page 6). One of the "General Purposes" of the municipal portion of Edmonton's Regional Planning Authority's "Preliminary Regional Plan" (1973) was:

> "To conserve the natural areas along rivers, creeks and ravines for active and passive recreation and scenic purposes."

An inventory of land uses in the river valley, ravines and adjacent areas contained in the Edmonton Parks and Recreation Department's "Master Plan" shows that over 40% of such lands (in excess of 3,000 acres/1,200 ha) were 'undeveloped park areas, including natural areas'. Accepted by Edmonton's City Council in 1971, the plan established a series of 'natural preserve areas' throughout the river valley. The "Master Plan" was recently revised and adopted by Edmonton City Council in August 1979.

In 1974, the Research and Long Range Planning Branch of the Edmonton Planning Department produced a "River Valley Study" - a policy review document that comprehensively reviewed policies and issues relating to the future development of the river valley and ravine system, (received as information by Edmonton City Council, June 1974). The document placed considerable emphasis on controls for environmental protection. Two years later, the Planning Department produced a "River Valley Control By-law" (draft 1977). The draft is being finalized and when completed it will go to Edmonton City Council. The draft had two major objectives. One was:

"Preservation of the River Valley and Ravine System as an environmental protection area."

B1.3.4.3 Britain

Recognition of the importance of retaining areas of natural vegetation and habitat was part of the overall concept in "new town" development. Harlow is an example. Such natural features as valleys, woods and brooks were retained as broad green swathes separating zones of urban development. It was stressed that these areas "should be kept as natural as possible and in no way turned into the character of a Town Park". One wood was retained as a nature reserve (Gibberd 1952, Page 10).

The Atherstone District Plan recommends protection of the countryside's natural character, taking into account the need for wildlife conservation (R.T.P.I. News, 1979).

A management plan for Peterborough's Ferry Meadows county park identifies different natural habitats, noting that over 150 species of birds have been observed in the park. Management recommendations are made in order to maximize the wildlife and educational value of the park (R.T.P.I. News, 1979).

B1.3.4.5 United States

General policies of the Los Angeles Open Space Plan (adopted by Los Angles City Council in June 1973) include the following:

"Ecologically important areas are generally considered as open space and shall be so designated. The following shall apply:

a. to the extent feasible, ecologically important areas should be kept in a natural state,

b. in the event a project is proposed within an ecologically important area, an environmental impact report shall be prepared,

c. the construction of roads through ecologically important areas should be closely controlled in order to protect these areas."

The Los Angeles Conservation Plan (adopted by Los Angeles City Council in December 1973) identifies a number of areas of environmental concern ranging from forests an soils to coastline erosion and air quality. For each, objectives are formulated as well as policies to achieve the objectives and programs to implement the policies. The following are policies regarding "Wildlife and Botanic Communities":

"1. The City shall restrict land uses in important wildlife habitat areas.

2. Maintenance of wildlife feeding areas on City-owned property shall be encouraged.

3. The City shall establish close co-ordir tion with the Forest Service on land in and adjacent to the Angeles National Forest.

4. The establishment of wildlife preserves in areas containing rare or endangered wildlife species shall be encouraged.

5. The City shall consider development of land use classifications, as necessary, to assure protection of important natural wildlife habitats or botanic communities.

6. All government agencies shall be encouraged to include areas identified as key wildlife areas or areas containing unique plant life for purchase.

7. The use of privately-owned off-road vehicles in identified key wildlife habitats and unique plant life areas shall be prohibited.

8. In key wildlife areas and/or ecologically important areas, tentative subdivision maps shall be submitted to the appropriate agencies for review of possible damage to wildlife habitat and violation of laws with respect to endangered species.

9. The City shall consider of paramount importance the preservation and protection of key wildlife areas and/or ecologically important areas, as identified in this Plan, in the design and construction of roads, if roads must be constructed in these areas."

The foreword of the "Environmental Protection" section of the San Francisco Comprehensive Plan (Conservation Section adopted by San Francisco City Council in May 1973) contains the following:

> "Deterioration of the environment as a consequence of population growth, urbanization, industrialization, resource exploitation and technological developments has been a growing concern worldwide. On a national and state level, it has given rise to policies and controls dealing with air, water and noise pollution and other forms of degradation of the natural environment. It was logical, therefore, that in giving direction to local general plans the California Legislature should have mandated preparation of two elements which address environmental protection issues, one for natural resource conservation and another for transportation noise. This Plan for Environmental Protection combines those two state-mandated elements."

A policy of the plan is to "preserve and add to open space...." and it is noted that the suitability of land for recreation is not the sole determinant of whether or not land ought to be preserved:

> "Features of a scenic, geological, topographical, and ecological nature are also important criteria of their value as open space. These natural values of the land should be respected."

In many cities in the United States, the preservation of natural areas is an established fact. An overview of Baltimore's Development Program (Baltimore Department of Planning, September 1977, Page 27) notes that "Natural Resource Areas" such as stream valleys and other land made unique by natural and geological features are presently a component of the City's recreational facilities.

In Boulder, Colorado, concern about the retention of the natural mountain backdrop and surrounding open space dates back to 1958. After a series of plans and other measures failed to check growth, Boulder's City Council adopted an Open Space Plan in 1974. The Plan calls for the eventual acquisition of some 10,000 acres (4,050 ha) of land, all of which is in small ownership. Within this land, areas approved for preservation include the following:

> "Natural areas characterized by: unusual terrain, unusual flora or fauna native or unique to the area, unique geological formations; water resources; scenic areas or vistas; wildlife habitat or fragile ecosystems.
>
> Open space for passive recreational uses such as hiking, bicycling, horseback riding, nature studies. (Walker 1977, Page 6)"

New York adopted a "special natural area" zoning category in 1975 that applies to any area which contains significant geological, topographical, aquatic or other natural features worth preserving (New York City Planning Commission, 1974).

A comprehensive approach to the identification and retention of natural areas has taken place in Boston where a plan prepared for the Boston Redevelopment Authority has recommended that the City's Conservation Commission and other City agencies acquire and preserve Boston's "urban wilds" (Opat 1977, Page 43). The study identified 143 sites, totalling 2,000 acres (810 ha) and including 68 sites of geological interest, 12 inland and 8 coastal wetland sites and 28 sites possessing important shoreline vegetation. The sites range in size from a fraction of an acre to over 200 acres (81 ha) (Boston-Urban Wilds, 1976, Page 20).

B1.3.5 EXISTING POLICIES AND STATUTORY REQUIREMENTS

Statutes and policies currently in effect which are related to the retention of natural areas in Calgary are as follows.

B1.3.5.1 Subject to certain exceptions, The Planning Act, 1977 provides for the creation of Environmental Reserve, at the time of subdivision, of all or any of the following:

> "(a) a swamp, gully, ravine, coulee, natural drainage course, or
>
> (b) land that is subject to flooding or is, in the opinion of the subdivision approving authority, unstable, or

(c) land that in the opinion of the subdivision approving authority, is unsuitable in its natural state for development, unless the applicant for subdivision approval can show to the authority's satisfaction that that land can be made suitable for development, or

(d) a strip of land, not less than 6 metres in width, abutting the bed and shore of any lake, river, stream or other body of water for the purpose of

(i) preventing pollution, or

(ii) providing public access to and beside the bed and shore."

(Section 95)

Respecting the use of Environmental Reserve the Act states:

"Environmental reserve may be used as a public park but if it is not so used, it must be left in its natural state." (Section 107 [1])

In addition,

"Environmental reserve may not be sold, leased or otherwise disposed of." (Section 115)

It should be noted that lands qualifying for dedication as Environmental Reserve as defined by The Planning Act, 1977, cannot automatically be considered as parcels of land constituting real environmental reserves i.e. lands of specialized nature conservation significance which are accorded 'reserve' or protected status. For example, lands in the Bow River floodway are presently dedicated Environmental Reserve under the provisions of The Planning Act, 1977, when subdivision takes place. For the most part, such lands are of nature conservation significance but in certain instances, as for example when gravel extraction activities or other operations causing extensive disturbance have taken place adjacent to the river, lands dedicated as Environmental Reserve may not be of nature conservation significance. The purpose of the provision for Environmental Reserve lands under The Planning Act, 1977, is not simply to acquire and protect lands of nature conservation significance. It is imperative to recognize this distinction when formulating guidelines for the management of natural areas and other environmentally sensitive lands (refer to Section B1.3.10.3).

B1.3.5.2 The Calgary Bow River Study Committee-"Report" (January 1974) recommended that:

"A variety of park settings ranging from natural areas to manicured urban parks, be established along the Bow River." (Page 7)

The report was approved, in principle with admendments, by City Council in June 1974.

B1.3.5.3 The Parks/Recreation Department's "Policy Statement and Planning Recommendations Report" (approved by City Council 1976) identified natural areas and escarpments as:

> " ... regional features in excess of 20 acres, portions of which may be developed to another park category." (Page 21)

The trend towards unstructured nature-oriented activities is noted and it is concluded that:

> "Urban residents will continue to place a high value on the natural park areas, within or close to the City, as major leisure time resources to be protected by the municipality." (Page 27)

As a component of the open space river/creek valleys system, preservation of major natural features is identified as a major goal. Out of ten major open space recommendations in the above report, the preservation of natural areas is given third highest priority . The policy states:

> "OS3. All natural areas that remain in the river valleys, Weaselhead Natural Area, Nose Hill Escarpments, and Beddington (West Nose) Creek Escarpments be preserved." (Page 31)

Examples of other policies are:

> "OS27. Some portion of all new park areas be set aside to retain, encourage or restore natural environmental areas.
>
> OS28. The building of utility lines be carefully controlled in designated natural areas.
>
> OS32. Areas designated "Natural Park Areas" have appropriate signing, encouraging the general public to aid in preserving them." (Page 44)

B1.3.5.4 The Calgary General Municipal Plan (1979) places strong emphasis on the retention of natural areas and contains the following policies:

> "3.6.24 PR.13 - Develop the river valleys as a parkland system which includes:
>
> (v) preservation of important major natural features which contribute to the value of the system.
>
> 3.6.24 PR.16 - Acquire major open space and natural areas, as part of the development of a total park and recreation network, in association with the Provincial Government.
>
> 3.6.24 PR.17 - Preserve undeveloped major escarpments as natural open space features to enhance the environment."

B1.3.6 PUBLIC CONCERNS

B1.3.6.1 The subject of natural areas and wildlife received more public attention than any other single 'issue' identified in association with the Calgary River Valleys Plan. The topic was raised repeatedly throughout the entire public participation program. There was near unanimity of

opinion that existing natural areas should be both retained and preserved. Concerns were related to the 'threats' posed by an expanding urban infrastructure and increasing recreational use. This section summarizes the relevant public input in an itemized form.

B1.3.6.2 Calgary Urban Shorelands Seminar - September, 1978 Questionnaire

- Concern was expressed regarding the disruption of geese nesting grounds by the development of Bow Village Green.

- It was proposed that the islands in the Bowness/Montgomery area become wildlife sanctuaries.

- A number of general comments were made as follows:

"Preserve natural areas with no development."

"Create natural open space."

"Since the valleys are Calgary's only natural resource, they should be preserved as physical and spiritual lungs, an opportunity for contact with nature."

"The river valleys are the only natural sanctuaries still left."

A desire was expressed to "come into contact with nature closer to home."

"Natural areas should be retained for spiritual renewal and tranquility."

"Show insensitive politicans and developers that it is politically and economically sound to preserve natural areas for people and wild ecosystems."

B1.3.6.3 Public Meetings of November 1978/January 1979 and Open Houses in May/June, 1979

Comments relating to natural areas were numerous and of both a general and specific nature. General observations stressed the desirability of retaining such areas in order to preserve flora and fauna and to provide for recreational use, particularly in facilitating mental relaxation from the pressures of urban living in aesthetically pleasing surroundings. Specific concerns were voiced where individual areas were perceived to be endangered. Problems mentioned included over-use and the encroachment of various urban land uses either too close to or actually onto natural areas. Transportation options for road construction within particular sites received considerable attention and were strongly opposed.

B1.3.6.4 Correspondence

Three letters were received as follows:

- Flora and fauna observed on the large island adjacent to Bow Crescent were itemized. It was recommended that action be taken to "set aside, preserve and classify [the island] ... as a natural protected animal and bird sanctuary."

- The various types of flora and fauna existing in the Queensland Downs area were listed and described in detail. It was recommended that the area be preserved as a natural area.

- The loss of natural habitat at Point McKay was lamented. The area once contained "wild flowers ... in such a variety and abundance that the area was a mini-reflection of the climatic zone which we occupy." A plea was made to "at least leave the riverbank alone" and the transportation option for the extension of Memorial Drive was accordingly opposed.

B1.3.6.5 Open House Questionnaire (Appendix XIII)

Question 1 asked respondents:

> "What use or combination of uses would you like to see made of the lands adjacent to the riverbanks in Calgary?"

Respondents were presented with a list of 9 uses and were asked to rank the options in order of preference. Choices ranged from totally undeveloped park to industrial and commercial uses. Natural areas were mentioned twice as follows:

> "Option (h) Parkland with some developed recreational areas and some undeveloped natural setting areas.
>
> Option (i) As a totally undeveloped park retaining its natural settings."

The two were consistently rated higher than any of the other options presented.

An open category, specified as "Other" was included in addition to the above-mentioned list of choices in order to allow specification of an unlisted use. Only 34 respondents (about 7% of the sample) did specify an additional land use. Of these, about 80% made direct reference to natural areas. Ratings, where specified, were either 1 or 2. Examples specified are:

> "... the less tampering the better."
>
> "... just leave well enough alone, those who want to use the banks, etc. will respect it, as should be."
>
> "... remain as is."
>
> "... combination of single-family residential, developed and undeveloped parkland."
>
> "... parkland with natural areas is best, but present development must be left alone."
>
> "... mixture of natural undeveloped, some slightly developed parks and existing residential development."

"... leave alone for environmental purposes."

"... leave riverbanks as they now stand with undeveloped natural areas left in its natural setting."

"... wildlife preserve with limited public access."

"... take a good look at the Edmonton riverbanks."

Question 5 listed 19 examples of types of facilities that might be provided on lands adjacent to the rivers (an additional 'other' category was completed by very few respondents). Respondents were asked to indicate whether or not they would like to see each facility. Two of the 19 categories made specific reference to natural areas as follows:

"a) Secluded quiet, natural areas.
q) Wildlife Preservation Areas."

Ninety-four percent of the sample wanted quiet natural areas and 83% wanted wildlife preservation areas, by far the highest rates of postive response recorded for any of the options presented in this question. The rate of non-response for these categories were 5% and 8% respectively, which were the two lowest rates of non-response recorded for this question. The average rate of non-response was 15%.

Question 7 presented a list of 9 frequently mentioned problems existing in present City parks. Respondents were asked to rank the list in order of perceived importance. One option specified inadequate protection of environmentally sensitive areas and was rated second only to vandalism in terms of perceived importance.

Respondents were invited to make additional comments on the reverse side of the final page of the questionnaire. 110 respondents did make comments (over 23% of the sample). Of these, 50 (over 45% of those responding) made reference to open space and 40 of these (over 36% of those responding) made specific reference to natural areas. Many comments were recorded at great length and a large number of observations were made. The following is a brief summary of the public input together with some specific examples of concerns raised.

There was a concensus of opinion that remaining natural areas should be left as they are. Few comments were anti-development in nature but it was felt that sufficient quantities of developable land exist elsewhere. Again, the most commonly expressed opinion stressed the desirability of allowing both wildlife and wild ecosystems to function naturally and of providing quiet places in the city where people can 'get away' for a while without the necessity of having to organize a trip outside the urban area.

Many of the comments received were quite emotional. No one expressed opposition to natural areas. Examples of some of the comments are as follows:

"We feel quiet, natural areas especially our riverbanks are so important to enjoy after a busy day's work."

"Leave the river as natural as possible! God knows - we have few enough natural areas left!"

"Above all else, let us all endeavour to maintain the natural QUIET of these God-given areas."

"People need more than 'function' in their life spaces in order to operate effectively and sanely."

"Calgary is a rapidly growing city which will need more quiet natural areas where people can exercise or sit quietly away from the noise and smell of traffic, etc. Now is the time to set aside land for the future so people will be able to easily escape from big city pressures whenever they have a spare hour."

Although informations is limited, it would appear that the interest and concern displayed by Calgarians towards their natural areas is not an isolated phenomenon. Studies in other areas of the country have produced evidence that points to "...a growing awareness by urbanites of the need for natural environment within their community" (McKeating 1975, Page 133).

B1.3.7 ASSESSING NATURAL AREAS - THE IDENTIFICATION AND EXPLANATION OF CRITERIA

B1.3.7.1 Recommendations concerning the desirable future status of natural areas must take into account both their potential for use and the desirable type of management. Determination of what use and management is appropriate is, in turn, dependent upon reviewing answers to a number of questions, namely:

- How important are the city's various natural areas as natural areas? i.e. What is their nature conservation significance?
- Nature conservation considerations accepted, what additional factors enhance their popular appeal?
- What are the limiting factors which may adversely affect the feasibility of preservation?

Accordingly, this section identifies 17 criteria directly related to the value and functioning of natural areas which are discussed individually under three broad groupings: biological, value-based and constraining criteria. To a greater or lesser extent, relationships exist between criteria both within and between the groups identified.

In this section, considerable reliance has been made on a document produced by the Nature Conservatory of Great Britian, which has identified biological sites of national importance in that country (Nature Conservation Review, Vol. I, 1977). This publication is hereafter referred to as 'The Review'. With the exception of seasonal value and the presence of natural physical features, all the biological and value-based criteria identified below are identical to the evaluatory criteria identified in that report. Commonsense and a review of the literature (Steinitz et al. 1969, Liddle 1975, Cordes and Pearce 1976, Gruttz 1977) confirmed the applicability and general acceptance of the criteria identified in The Review. The manner in which the criteria are applied varies in

accordance with site, scale and locational considerations. This is accounted for in the ensuring discussion of the criteria.

B1.3.7.2 Biological Criteria

It should be noted that regardless of the type of ecological conditions existing within an area, 'value' is not an intrinsic quality of any ecosystem but reflects the extent to which people generally perceive specific biological considerations to be of importance or significance. None of the biological criteria identified below have any value in the absence of human judgements in other words, there are no biolobical absolutes. The point is made succinctly by Fleishman (1969, Page 26):

> "The jusitification of conservation as a biological truth is a fallacious and distrubing sign ... Conservation is based on human value systems. Its validation lies in the human situation and the human heart."

Wagar (1974, Page 278) referring to the necessity of imposing management limitations upon recreational use in ecologically sensitive areas, recognizes the potential implications of Fleischman's observation:

> "Although physical characteristics may define a site's initial durability, the decision to limit use rather than 'let the site deteriorate', 'intensify management', or even 'pour more concrete' is dictated by human objectives, not ecological imperatives."

The biological criteria discussed below, therefore, allow only the evaluation of the significance of natural areas from the standpoint of nature conservation.

i. Size: This is a basic criterion which is related to many other variables. Generally, a positive relationship exists between value and size; larger sites tend to support a greater range of species and habitats. The concept of the 'viable unit' is based on the recognition that all species' viability is dependent upon certain minimum space requirements (Edwards, Page 62). However, Fox (1977, Pages 14-15) notes:

> "Too often one hears the criticism that a certain reserve is not good because it is too small. In such an instance the critic is usually thinking of a few large species which the small area can no longer support. What he is forgetting is the vast constellation of species that do exist in the area, the microbes and small vertebrates which belonged to the original 'complete' ecosystem. Such a reduced system will probably be unstable initially but will eventually settle back to a dynamic equilibrium."

Inevitably, within an urban area even 'major natural areas are relatively small, embracing the lower levels of Crowley's hierarchical framework for ecosystems and ecoregions (Crowley, 1967). As such, the degree of homogeneity is fairly high (Cassie et al., 1970, Page 24). However, in a comprehensive open space system which

contains natural areas, a corridor for wildlife movement exists and the total complex of sites may function collectively at a higher hierarchical level in their ability to support species. It follows that even the smallest biogeographical unit, such as a stand of trees on a single parcel of soil, may be of vital importance as a 'link in the chain' (Leedy, et al., 1978, Page 52).

Dependent upon other variables, the size of a site will reflect its suitability for recreational use. Usually smaller sites are less capable of supporting use without serious modification.

Size is also a factor with respect to the degree of development of plan communities. For example tall, well-grown trees are preferable to small, stunted specimens.

ii. Diversity: This refers to variety in the numbers of both species and communities, both of which are related to habitat. Certain types of habitats are known to support greater species diversity than others. As part of a study aimed at maximizing wildlife considerations in the planning process in Woodlands New-Town, just north of Houston, Texas, Maestro (1973) listed habitats ranging from woodlands to urban areas and identified the number of species (mammals, reptiles and amphibians, and birds) present in each. Coniferous and deciduous woodlands received exteremly high scores and all habitats associated with the presence of water also scored highly as indicated in Table 1 below.

TABLE 1

HABITATS FOR WHICH WILDLIFE SPECIES SHOWED A STRONG AFFINITY IN THE WOODSLANDS NEW-TOWN AREA OF EAST TEXAS

HABITAT TYPES	MAMMALS	REPTILES AND AMPHIBIANS	BIRDS	TOTAL
Coniferous woodlands	16	13	87	116
Deciduous woodlands	17	12	84	113
Woodland edges	1	4	21	26
Old fields	9	9	59	77
Meadowns	5	9	12	26
Ponds	0	17	29	46
Creeks	10	40	43	93
Marshes	5	20	52	77
Swamps	2	27	28	57
Lakes	2	18	40	60
Orchards	1	2	6	9
Farmland	3	2	28	33
Urban areas	4	2	5	11
Suburban areas	4	2	28	34

Source: Leedy et al., 1978, Planning for Wildlife in Suburbs, Planning Advisory Service ASPO Rept. No. 331, Page 18.

Diversity is closely related to size as both species diversity and the probability of habitat variation increase with size.

iii. Naturalness: True natural areas exist where ecological systems are complete and funcion as they would under pristine conditions (refer to Section B1.3.2). Resource inventory programs can adequately determine the completeness of ecosystems by identifying their structural and functional components and evaluating the extent to which they function according to pristine conditions. Of particular importance are the cycling of materials,

energy pathways and food chains (Blook, 1974, Page 5 - 8). Given that absolutely pristine natural ecosystems no longer exist, the degree of naturalness exhibits great variability and will generally be lower in urban as opposed to non-urban environments.

In many parts of the world, truly natural areas either do not exist or are tiny and fragmented. This is so in Britian and much of the rest of Europe. There, the existing cultural landscape has been gradually imposed over a period of numerous centuries. The original woodlands have long been cleared and where there is no urban development, agricultural activities are ubiquitous. This is true even in the National Parks. The same process is repeating itself in North America. For example, the majority of Canada's prairies are under cultivation. The original grasslands have almost disappeared.

In both of the above cases the original pristine ecosystems no longer exist. Yet they do exist in the City of Calgary in a substantially unmodified form, even in the downtown area. This results simply from the relatively short period of time that the area has been settled. The most striking example of this can be found on the forested north-facing escarpments located on the right bank of the Bow River west of the Crowchild Trail and Bowness Park. Some of these trees, notably the Douglas Fire, are hundreds of years old. They were mature before European settlement of this continent began. No historical records exist in this part of the world at the time when they were seedlings. Consequently, in the city, there are not only natural areas which would be the envy of naturalists in most European countries but also a few very special trees, living prehistoric relics of a pristine past.

In urban areas, the naturalness of natural areas is most adversely affected by physical disturbance, as when vegetation is cleared or exotic species are deliberately introduced. However, the presence of exotics is not always detrimental since the functioning of an ecosystem is not necessarily seriously impaired. The Review notes:

> Nature conservation interest is affected by the degree of modification, in both structure and species composition. An abundance or predominance of obviously introduced species usually, in fact, reduces the value of an area, though in moderation, non-indigenous species may add to diversity and interest" (Vol. I, Page 7).

iv. Rarity: The presence of rare species or communities in an area adds significantly to its nature conservation importance.

The importance of this criterion is affected by both scale considerations and the reason for rarity. For example, species that may be rare in the city but are prolific outside the city are less important than species found in the city which are rare on the Canadian high western plains. The latter may be 'frings' species that are at the limit of their climatic environment or 'relic' species with a discontinuous distribution due to historical processes which have contracted and fragmented their range. Such species are of considerable ecological

and biogeographical importance. The reason for the rarity is particularly important as it affects management.

v. Fragility: This is defined as the degree to which communities, habitats, and species are sensitive to environmental change. This sensitivity can be intrinsic, as in the case of certain vegetational types and associated animals which, The Review notes, "are inevitably unstable and emphemeral" (Vol. I, Page 8), or extrinsic, as when recreational use will cause irreversible damage. Fragile sites are highly valued but when linked to rarity it may be effectively impossible to ensure their survival.

Fragility is obviously determined as a result of detailed site investigations. It is, however, possible to generalize about what types of sites are likely to be most sensitive to environmental manipulation. Leedy et al. (1978, Page 26) studies a number of types of sites concluding that "larger wooded areas are the most sensitive since they have the greatest potential for serving as refuge areas for wildlife. The more they can be protected, the more likely they will be to function in this capacity."

Together, fragility and rarity are the two criteria which place the most stringent constraints upon the use of an areas.

vi. Typicalness: Whilst 'key' sites often contain unusual featues, The Review notes that:

> ... it is also necessary to represent the typical and commonplace within the field of ecological variation, insofar as this contains habitats, communities and species which occur extensively or commonly. "(Vol. I, Page 9)

This criterion is of particular importance when considering the potential research value of some sites where homogeneity may be a desired feature. It should be noted that typicalness does not restrict the applicability of any of the other biological criteria at any one site.

In Calgary, the Balsam Poplar riverine forest is an excellent example of a naturally occuring community 'typical' to this area.

vii. Seasonal Value: Significant seasonal variations in the value of certain sites occurs due to the influx of animals, birds and other creatures and annual variations in the richness of flora. For example, grasslands exhibit the greatest interest in the spring when numerous plants are growing. Similarly, certain habitats are preferred by migrating birds in the spring and fall.

In Calgary, the most notable example of seasonal variation occurs in natural areas adjacent to the Bow River in the southeastern part of the city and is a direct albeit accidental by-product of man's interference with nature. Thermal pollution from the Bonnybrook Sewage Treatment Plant keeps the river free of ice in the winter with the result that fish, waterfowl and certain shorebirds remain in this area throughout the winter. These, in turn, attract predators such as coyotes, wolves and Bald Eagles. The last is a rare bird, attracted to wintering sites in the city because it is ensured of a supply of food.

B1.3.7. Value-Based Criteria

In recognition of the needs to evaluate additional considerations in order that the aggregate value of the respective natural areas may be judged more closely, those criteria which add interest and value to a site based on generally accepted human preferences which impart a perceived desirability are discussed below.

i. Recorded History: This relates to the interpretive potential of sites due to historical occurrences. The existence of any site specific geomorphological, geological or biological scientific study has obvious interpretive implications. Additionally, the absence, or presence, and completeness of accurate inventories with respect to communities, habitats and species in an area is of central evaluatory importance. Other factors imparting historical significance have been identified as follows:

- events of historical significance related to persons; events; religions and cultures; architectural styles; and the 'Western Frontier' (Whitman et al., 1971, Page 10).

Presently, records relating to Calgary's natural areas are mostly incomplete and fragmentary. However, information available appears to indicate the existence of a wealth of applicable historical and scientific material.

ii. Position in an Ecological/Geographical Unit: This criterion relates to the contiguity of sites. It is desirable to include the maximum number of species, habitats, communities and formations within a single area unit. An example might be a coniferous forested escarpment which is contiguous to a balsam poplar riverine forest and associated aquatic habitats. This criterion is of greater relative importance towards the fringes of the city as fragmentation of natural corridors of wildlife movement can effectively impede the movement of many species into the city.

iii. Potential Value: This refers to the potential for the regeneration of high quality ecosystems either through natural change or mangement. This is of particular importance in Calgary where disturbance exists in a number of natural areas. The types of communities, habitats and species affected, and the nature and extent of the disturbance are the central considerations in determining the ability of affected areas to regenerate. Where disturbance is particularly severe, but not of such an extent as to seriously impair high quality ecosystems on other portions of a site, the potential may exist for the creation of localizd recreational activity.

iv. Intrinsic Appeal: This criterion relates to the presence or absence of site characteristics which people generally perceive to be desirable. Two major components can be identified:

a) Visual Quality:

A subjective assessment based on personal perceptual preferences: the visual aspect presented by a wooded coniferous escarpment is certainly very different from that of an open prairie landscape. Because wide disparities exist in individual perceptions (see for example, Ritchie, 1974) any two individuals may have opposing preferences with respect to the visual qualities of the two landscapes. However, certain visual characteristics are generally perceived to be

desirable and many techniques for visual assessment based on ranking scales have been developed (refer to Section B1.3.8).

Another source of variation is the relative qualitative differences exhibited between different environments. A site which may be visually outstanding in a city, for example, may rate rather low when compared to National Park type vistas.

A rather cursory overview of the visual quality of the Bow River corridor contained in "The Bow River Impact Study" (Lombard North, 1973) does indicate that the presence of green areas throughout the river corridor rated very highly as compared to cultural features of the urban environment.

b) Plant and Animal Species:

These are perceived in a widely disparate manner. However, certain general preferences are evident. For example, songbirds are generally perceived as desirable whereas beetles are not. Similarly, orchids are preferred to mushrooms. The Review notes:

> "While science may veiw all creatures as equal ... pragmatism dictates that in nature conservation it is realistic to give more weight to some groups than others. (Vol. I, Page 10)"

v. Presence of Natural Physical Features: This includes such features as escarpments, springs, geological outcrops, incised meanders, exposed strata, and fossil beds. The presence of an interesting feature of the physical environment adds interest, has interpretive potential and may even provide a habitat - an example being a slough occupying the relic of a former river channel. This criterion can tie in with that of recorded history as in the case of the glacial erratics found in the Nose and West Nose Creek areas. As part of the Foothills Erratic Train, the boulders were historically utilized by buffalo as rubbing stones. The dual geological/archaeological interest confers added status to these features.

B1.3.7.4 Constraining Criteria:

Taken together, the criteria identified above enable an evaluation of the quality of Calgary's natural areas to be made. The value of such areas is dependent upon their retention in essentially their present form, and it is desirable to made provision for some degree of public use in many instances. Recognizing this, in order that a comprehensive evaluation of such areas can be made, it is necessary to consider those factors which place constraints on the viability of achieving the dual aims of ensuring preservation and providing for use. Accordingly, the following listing identifies those criteria which generally play an inhibiting role on the nature conservation significance of any natural area. It should be noted that from differing perspectives, even that of providing for recreational use, some of the following can be considered as positive criteria.

i. Developability and Economic Value: If the physical characteristics of a natural area are such that it is a 'given' (refer to Section B1.3.3.1vi.), the likelihood of preservation is much greater than if it is prime real estate. If the site is developable, the desirability of preserving the site must be weighed against the purely economic cost of not

realizing the development potential of the land. Even 'givens' are susceptible to encroachment by transportation corridors and utility rights-of-way.

Leedy et al. (1978, Page 25) state that because of the inhibiting effects on wildlife movement:

> "... all efforts should be made to minimize crossing the open space system with major roads."

Obviously such crossings also have highly significant and deleterious direct physical impacts upon existing habitats and vegetation. Leedy et al. (1978, Page 46) identify wetlands and areas of critical habitat for endangered species as the areas which are most sensitive to roadway construction which "must be avoided".

ii. Ownership: This criterion is obviously closely related to the above criterion. For private landowners, the incentive to realize the conomic potential of a developable site is considerable. Also, no legislation exists to ensure the preservation of private natural areas. However, public natural areas are often subject to the adverse effects of heavy recreational use. Consequently, the considerations relating to this criterion are highly variable, dependent on the site under consideration. As a generalization, the preservation of a natural area is more likely if the land is in public as opposed to private ownership. It becomes most difficult to preserve a natural area when the site is in fragmented ownership.

iii. The Nature of Surrounding Land Uses: An important criterion, it reflects the generally accepted necessity of having a 'buffer' zone surrounding natural areas. Related criteria are the rarity and fragility of a site. Obviously more sensitive sites require more effective buffers.

Leedy et al. (1978, Page 26 et seq) provide an insight into which urban uses are preferable adjacent to natural areas. The presence of children and domestic animals is most detrimental due to trampling and disturbance of vegetation and frightening of wildlife. As such, they state that the level of disturbance is greatest adjacent to high density residential subdivisions where units have a high bedroom count, a characteristic indicative of the presence of children and pets.

Leedy et al. (1978, Page 25) also note:

> "The reactions of wildlife to human disturbances such as noise and physical activities vary. Continuous noise and movement has little effect on most species, whereas discontinuous or intermittent types of disturbance may greatly affect wild animals."

The truth of this statement is readily observable. As an example, Canada Geese can frequently be observed in the early spring on the strip of parkland adjacent to Parkdale Boulevard opposite Lowery Gardens. The continual movement, noise and exhaust fumes from rush hour traffic is ignored, but if a bus stops to let off passengers, or a cyclist or jogger approaches, they will quickly fly away. A similar phenomenon is observable where natural areas exist adjacent to industrial land uses in the city. For example, the water filled gravel pit on Klippert

Concrete land is used as a waterfowl nesting ground while the natural area on land adjacent to the Cominco plant is one of the most outstanding in the city.

Generally, light industrial and commercial uses and transportation corridors function as effective buffers. Again, the specific type of use is all important. A small commercial area should preferably face away from a natural area so that the focus of retail activity takes place unobserved from the natural area.

Where present intensive land uses abut natural areas they act as a de facto limiting factor whereas in areas as yet undeveloped there is an opportunity to plan for compatible land uses.

iv. Probable Intensity of Use: The qualities of natural areas generally decline as recreational activity intensifies. A fairly comprhensive review of the literature pertaining to the ecological effects of outdoor recreation by Speight (1973) clearly illustrates that this use results in a number of deleterious side effects including soil creep, break up, enrichment and eutrophication, compaction; a decrease in species diversity, composition and percentage cover; the loss of habitats and disturbance, and changes in the species composition and mortality of fauna.

Given this scenario and accepting the fact that Calgary is experiencing a period of phenomenal growth, it is clear that in the absence of careful planning and mangement, Calgary's natural areas will not survive in anything like their present form. The problem is compounded by the necessity of providing some degree of recreational use. It is neither viable to permit, nor justifiable to prohibit, public access to all of Calgary's natural areas.

This criterion is clearly related to those of accessibility and adjacent land uses.

v. Accessibility: This is a variable constraint dependent particularly on the quality of a site and the probable intensity of use. It is desirable that the 'highest' quality sites and sites containing rare or fragile species receive less use. It should be noted that the location of a major transportation corridor adjacent to a natural area may be an effective method of reducing accessibility. Again, the greatest planning opportunities exist in presently undeveloped areas.

B1.3.8 EVALUATING THE CRITERIA

Qualitative differences exist between Calgary's various natural areas. These differences are particularly significant with respect to key biological criteria such as size and naturalness. This spectrum of qualitative variation has important implications for potential recreational use, site planning and management. Accordingly, it is desirable to make broad qualitative distinctions between the various Major Natural Areas identified.

An obvious evaluatory technique is to use a standardized procedure that will enable a direct measurement of quality by means of assigning point values to the individual criteria in order to produce an aggregate score. If points are allocated on the basis of whether or not specific considerations relating to each criteria are favourable or unfavourable, the total score becomes an absolute measure of quality. Such scoring systems are in

common use and the pertaining literature is extensive. The range of applicability is considerable; they have been used to analyze public input in the decision-making process of agencies (Clark et al. 1974), to evaluate the scenic qualities and use potential of National Forests in the U.S. (U.S.F.S. 1959), to determine the environmental impact of the U.S. Bureau of Land Reclamations water resources projects (Dee et al. 1973), to rate the 'degree of natural enviroment' of small urban river valleys (Whitman 1968), and to inventory, on a continental wide basis, the resources in Canada (Canada Land Inventory, Report No. 1, 1970).

Unfortunately, problems exist which seriously impede the utility of this technique in evaluating the quality and potential use of Calgary's natural areas. These are threefold and may be summarized as follows:

i) Due to the direction and emphasis of work in this area, relatively little attention has been paid to evaluating the scenic qualities and use potential of areas of natural environment existing within urban areas. Most research has focused on federal forest lands, wild and scenic rivers, National Parks and the like. Precedents for the use of this technique in the context required are, therefore, limited.

ii) A number of methodological problems inherent with the use of the technique have been recognized by researches. These include problems involved with the necessity of using different parameters to measure widely differing sets of conditions and criteria, the assignment of arbitary weights and the continued use of simple rating procedures. The latter has considerable methodological drawbacks, particularly where there is little homogeneity amongst the variables under study.

The Review identifies some problems associated with the use of the technique as follows,

> "Not only are there complexities difficult to deal with, such as the frequent lack of independence of criteria and the varying absolute and relative values of different criteria according to requirements, ecosystem group and locality, but the basic information for different formations and sites is so variable at present that a scoring system cannot be evenly applied ..." (Vol. I, Page 11)

The Review concludes that the use of such a system to evaluate natural areas can only lead to "a spurious objectivity."

iii) Present inventories of the biological criteria identified are incomplete, particularly with respect to such key criteria as fragility and rarity. Detailed information sufficient to satisfy the requriements of each criterion is a prerequisite to the formation of an acceptable evaluatory scoring system.

On the basis of the above itemized problems it is felt that use of a scoring system to evaluate the quality and potential use of Calgary's natural areas would be inappropriate at this time. It is suggested that use of such a technique may be practical and desirable as and when specific problems are addressed. Specifically, preconditions would involve:

- formulating a method specifically tailored to Calgary's present requirements which is refined to the extent that inherent methodological problems are limited, and
- possession of an adequate data base.

In rejecting the obvious technique for evaluating Calgary's natural areas, it is recognized that the need remains for at least a preliminary ranking. This need is strictly limited at the present time. It is necessary solely to give any individual or agency responsible for the preparation of a site plan an indication of the overall quality of that site as compared to other such sites. This is necessary as all the Major Natural Areas identified are major environmental resource features of city-wide significance and should not be planned in isolation. The indication of relative quality is only one of a variety of considerations which must be taken into account in determining the most appropriate type of use and management for any one site (refer to Section B1.3.10.4). An additional benefit of the evaluation is that it does give the general public an indication of where the most important sites are. Thus, the ranking also has a purely interest value.

It is fortuitous that the present requirement necessitates only a general distinction between sites as the amount of information presently available with respect to the evaluatory criteria identified is extremely variable. Indeed, the nature of the criteria are such that collection of a complete data base in any one area poses a number of methodological problems. Consequently, only broad distinctions are recognized and the number of ranking classes is limited to three.

The evaluatory classes were derived in the following manner. Initial preparation of the background Environmental Inventories ('Land Use Inventory and Analysis' - Sections A3, B3, C2, D2) involved field study and air photo interpretation of each site. This provided much of the base data. Subsequently, each of the biological, value-based and constraining criteria were addressed specifically for each site. This involved additional field work and air photo interpretation and also the itemization of all past works and existing policies and proposals affecting each area, such as the past installation of utilities or proposals or options for road construction. Archival sources were of value with respect to past activities. Members of the Calgary Field Naturalists' Society provided valuable information concerning biological criteria for many sites. The resulting information was very comprehensive with respect to certain criteria for individual sites, and rudimentary or non-existent for others. Rankings were based on the evaluatory criteria. Constraining criteria were recognized to the extent that they place qualitative limitations upon existing sites. However, there is no logical or justifiable basis for including possible future constraints upon existing natural areas as the various impacts exhibit great spatial and temporal variation. Additionally, the potential impacts of any development can only be broadly assessed when specific proposals are made, accompanied by detailed plans.

The final rankings were based on a concensus of opinion of representatives from the Calgary Field Naturalists' Society, and the City Parks/Recreation and Planning Departments. In this way, it was possible to eliminate obvious potential sources of bias such as personal preferences concerning the weighting of particular criteria.

The procedure adopted for the derivation of ranking classes was, therefore, collective, logical and systematic. It is emphasized that rankings have been created for a specific purpose, that they are preliminary and are subject to revision as and when more information becomes avaiable and/or when site conditions change. It should also be noted that the rankings are probably conservative in that as more research is conducted, additional information will probably materialize regarding, for example, hitherto unobserved species, rare and fragile communities.

B1.3.9 DISCUSSION: PRESERVATION, USE AND MANAGEMENT

Resolution of the dichotomy existing between preservation and use is the principle aim of managers of environmental reserves throughout the world. The problem can be simply stated. Preservation for the future conflicts with recreational use and enjoyment in the present. With increasing use there generally occurs a reduction in both the overall quality of the resource and the recreational experience of the user. Manifestations of this process take various forms including not only those ecological impacts outlined in Section B1.3.7.4(iv) such as trampling of vegetation, the disappearance of rare and fragile species, increased erosion, eutrophication, and activity conflicts but also crowding, 'spoilt' animals, and air pollution. Eventually, the users may destroy the very qualities they come to look for.

There is an increasing concensus of opinion that it is necessary to place restrictions on use in order to ensure preservation. This is not, for the most part, a measure which can be implemented without having conducted detailed site studies and monitoring. In urban areas particularly, the nature of land economics ensures that considerable justification is required. It is probably unrealistic to expect an urban open space recreational system to fulfill all opportunities existing throughout the whole spectrum of recreational demands. The immediate problem with respect to Calgary's natural areas becomes one of mitigating and controlling adverse recreational impacts on the resource. Accepting that preservation of these resources is essential, the types of management policies in existence and the manner of implementation is the key to determining how well, or how badly, the resources stand up to demands placed on them.

Preservation, use and management components are, in fact, indivisible. The major characteristics of the foregoing resource components and their actual use are an essential part of the overall formulation of a suitable management policy.

It is generally accepted that any form of environmental preserve requires management, even in the case of 'true' wilderness (see, for example, Lucas, 1973). The smaller the area involved and the greater the projected intensities of use, the greater the need for active management (Hendee, 1974). Because of the nature of the informal relationship between the variables of use, preservation and management, the management component is the 'active' variable in that it controls the ultimate status of the other two. It follows that management personnel should be sensitive to changes in the other components but also that their range of options be limited in accordance with stated goals pertaining to the resource and its use. Management personnel require direction, but not to the degree of specificity that precludes their ability to react effectively to changing conditions and processes, nor to the degree of generality that would permit incompatible changes to occur.

The above point can be effectively illustrated by means of an example. If public access is permitted in a natural area, trail erosion may begin to take place. If, for example, this involves fine grained soils on a steep escarpment, the erosion may seriously damage the resource and considerably inconvenience the user. Proper trail construction can minimize adverse environmental impacts and eliminate user inconvenience. If, on the other hand, public use should become such that there is a demand for developed play facilities, the decision of whether or not to construct such facilities clearly has to be taken at the expense of either the resource or those desiring facilities. In this instance the mangement decision should not be discretionary but based on a mandate with respect to the purpose of the resource.

B1.3.10 MAJOR NATURAL AREAS

B1.3.10.1 The Mandate

All decisions, options and policies affecting a particular resource hinge upon whatever mandate exists for the management of that resource. The need for such a directive is discussed in the previous section (B1.3.9). Accepting that it is desirable to retain natural areas as a component of the open space system in the river/creek valleys, there are only two possible types of mandate - one of which places the value of recreational use above that of the resource, or one which places the value of the resource above that of recreational use. The two cannot be given equal priority as there are numerous instances where they conflict. The issues involved are complex and any decision is debatable as it is ultimately a value judgement based on philosophical considerations.

Open space lands in the river/creek valleys have the potential, presently not fully realized, to provide a wide variety of recreational activities and experiences. It is unrealistic to expect any one area or any component of the open space system to cater to the complete spectrum of such activities and experiences. It is also undesirable as it would detract from the spatial variety and diversity of recreational uses which is an attractive feature of the proposed system. The Major Natural Areas identified are the remnants of the Calgary region's natural environments which have, to date, survived the process of urban growth. They are unique and irreplaceable. They have the potential to provide a specific type of recreational experience which is not substitutable. The value of this experience is based upon the continued existence of the natural qualities of the areas identified. The public has given a strong indication that they place a very high value on naturalness. Consequently, the position adopted in this plan is that the recreational management's mandate should recognize the precedence of preservation over recreational use.

B1.3.10.2 The Evaluatory Rankings

The Major Natural Areas identified are the highest quality natural areas selected from the Major Environmental Resource Features discussed in the Environmental Inventories ('Land Use Inventory and Analysis' - Sections A3, B3, and D2). They are ranked in three calsses based on the evaluatory criteria itemized in Section B1.3.7 and in accordance with the principles discussed in Section B1.3.8, on the basis of the best information available. Qualification of individual rank assignments can be found in Section B1.3.11, which is based on the rankings itemized below.

The majority of the sites identified are as yet unnamed. The numbers in brackets followed by the locational description of each site are cross-referenced with the map of 'Major Natural Areas' (Figure 2). Sites are numbered from upstream to downstream for each river. 'B' denotes the Bow River, 'E' the Elbow River and 'WN' West Nose Creek. Thus, site 'B1' is the furthestmost upstream site on the Bow River. The order of listing is not indicative of any qualitative differences existing between sites within a grouping.

The Major Natural Areas are also identified individually in Section B1.3.11 by means of a site specific key map, which indicates the actual site in relation to surrounding lands.

CLASS 1: Calgary's finest natural areas in the river/creek valleys. They rate very highly according to several of the evaluatory criteria identified. The criterion of relatively large size was a prerequisite for inclusion in this category.

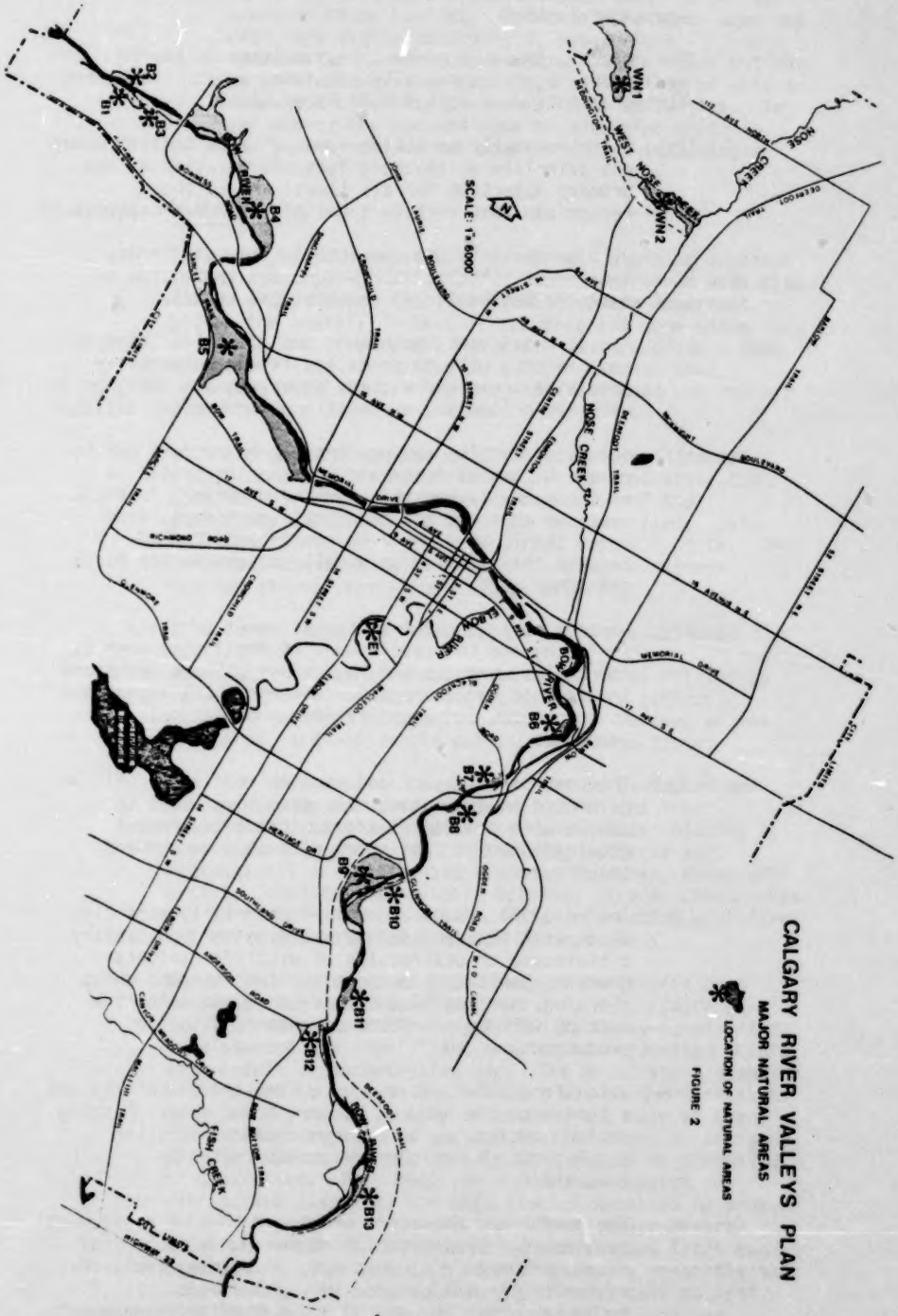
Sites:
- (B1) The Riverine Escarpment on the right bank of the Bow River extending west from approximately the 33 Avenue N.W. alignment.
- (B5) Edworthy Park and abutting lands.
- (B6) The Inglewood Bird Sanctuary.
- (B9) The Cominco Natural Area.

CLASS 2: Outstanding sites of only slightly less significance than Class 1. They may be slightly smaller and duplicate some features of Class 1 sites.

Sites:
- (B3) The area commencing at approximately the 33 Avenue N.W. alignment - bounded on the west, north and east by the west channel of the Bowness Lagoon and on the south by the riverine escarpment.
- (B4) Bowmont Park.
- (B8) An area of riverine flatlands and escarpment on the left bank of the Bow River abutting the C.N.R. railway line and Beaver Dam Flats Park.
- (B10) Carburn Park.
- (B13) An extensive area of riverine escarpment including some small areas of riverine flatlands located opposite the Fish Creek Provincial Park.
- (WN1) The south-facing escarpment situated to the West of 4 Street N.W. and north of West Nose Creek.

CLASS 3: Sites of lesser importance from the point of view of nature conservation. They may be small or extensively disturbed but do contain areas of natural environment which may be equal in quality to the best examples contained in the other two classes.

Sites:
- (B2) An area of riverine flatlands on the left bank of the Bow River opposite the western extremity of Bowness Park.
- (B7) An area of flatlands on the right bank of the Bow River immediately south of the Bonnybrook Bridges.
- (B11) An area of riverine flatlands on the left bank of the Bow River located predominantly north of the private Commac Bridge at approximately the 108 Avenue S.W. alignment.
- (B12) The riverine escarpment adjacent to Queensland Downs.
- (E1) Elbow Island Park.
- (WN2) West Nose Creek valley east of 4 Street N.W.


SCALE: 1"= 6000'
WN1
WN2
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
B13
E1
NOSE CREEK
FISH CREEK
CALGARY RIVER VALLEYS PLAN
MAJOR NATURAL AREAS
LOCATION OF NATURAL AREAS
FIGURE 2

B1.3.10.3 Guidelines: A Policy For Environmentally Sensitive Areas

In August 1979, a document entitled "A Policy For Environmentally Sensitive Areas" was produced as a joint project by the City of Calgary Parks/Recreation and Planning Departments. The report was approved by the Calgary Planning Commission as a policy guideline on September 5, 1979.

The report suggests a number of guidelines to govern management in environmentally sensitive areas. These are listed as follows (Section 5.7, Pages 12-13):

"(i) Environmentally sensitive areas will be managed under the principle which recognizes preservation as the primary objective for all lands, and further recognizes that certain types of outdoor recreation

will be the only use permitted on certain lands. Management policies will ensure the protection of natural, aesthetic and recreational values.

(ii) Forest management techniques such as crown thinning and planting will be permitted in environmentally sensitive areas where these practices are designed to maintain or improve a specific environmental quality.

(iii) Selective cutting and pruning may be carried out to remove hazardous trees and branches on trails in environmentally sensitive areas. However, in those sections that are not near trail corridors, dead trees should be allowed to remain undisturbed, because they provide an excellent habitat for birds and other wildlife.

(iv) Limited environmental manipulation (i.e. trail surfacing and the development of facilities such as boardwalks, bridges and log steps) will be permitted in order to reduce negative environmental impact and to ensure the continued existence of natural processes.

(v) The control of insect and vegetative disease will be permitted in environmentally sensitive areas to comply with provincial and municipal government requirements and consistent with good management techniques.

(vi) The wildlife resources of environmentally sensitive areas will be sustained by avoiding the unnecessary disturbance or destruction of wildlife habitats. However, habitat management such as tree and shrub planting, nesting site improvements and selective cutting will be permitted to enhance wildlife production.

(vii) Wildlife populations may be controlled where they are a threat to the natural values of the area. Missing native species may be reintroduced and existing populations replenished, where biologically feasible."

The guidelines embrace a broad spectrum of management techniques. Specification of one (or a number) of management option(s) does not, of course, imply that it (or they) will be used in any one area. It is recognized that any of the above itemized management techniques may be justifiable in any one area due to site specific considerations or exceptional circumstances. However, ultimately it is simplistic to adopt any guidelines which encourage the use of a range of specified management techniques for any resource that is not discrete and homogeneous as this may restrict justifiable future management options or permit use of an option that is not desirable. For

example, guideline No. (i) above implicitly assumes that some form of on-site recreational use will always be appropriate. This may not always be true. If a particular site generally contains little of nature conservation or aesthetic significance, but does support rare and fragile species, it may be necessary to disallow recreational use in order to preserve those species. Conversely, another area may rate very highly according to both nature conservation significance and aesthetic value but not be particularly fragile. Such an area may be able to support a diversity of recreational activities. In any event, the correct time to determine what management options are appropriate is following a detailed site study.

B1.3.10.4 On-Site Study

This study is concerned with an overall planning approach to the river/creek valleys. It is not concerned with site design except where specific facilities are important within the overall context of the proposed open space system in the river/creek valleys. It is desirable that before any site identified as a Major Natural Area undergoes facility development, detailed land use concept plans-"master plan" be prepared.

In the process of preparing detailed land use concept plans for any Major Natural Area, it is imperative that considerable attention be devoted to each of the evaluatory and constraining criteria identified. This will constitute the basic background inventory data. This information must then be related to other pertinent considerations, specifically the following:

-the demand for, and types of, possible recreational activities
-the relative overall quality of the site as related to other Major Natural Areas (the evaluatory ranking)
-the recreational manager's mandate, the purpose of the resource, and applicable policies and objectives.

Once the data base is complete it can be evaluated and interpreted by means of preparing intra- and inter-relationship matrices indicating constraints relating to the evaluatory criteria, constraining criteria and recreational activities and demand. Together, these will clearly identify unacceptable options, general constraints and what opportunities exist. This information will form the basis for detailed land use concept plans.

Where lands adjacent to Major Natural Areas have been developed for residential use, an informal network of trails develops quickly, vegetation is damaged, wildlife is disturbed and significant qualitative reduction occurs as a result of uncontrolled use. The most recent examples of this can be seen in Bowmont Park and on the Queensland Downs escarpment. In this situation, the role of the recreational manager is reduced to attempting to mitigate adverse impacts whereas ideally they should be prevented or controlled. This requires forward as opposed to retroactive planning, the objective of which is to prevent potential problems from arising. Where Major Natural Areas are presently surrounded by undeveloped lands and development is proposed or impending (as is presently the case in McKenzie and in Calgary North adjacent to West Nose Creek), it is desirable that detailed land use concept plans be prepared prior to the development and settlement of these areas. The logical time to do this is when sufficiently detailed information about the proposed development is available. This is usually at the time of approval of the Area Structure/Area Redevelopment Plans.

Finally, because the ultimate value of any natural area is equivalent to its perceived value (refer to Section B1.3.7.3) and because the primary purpose in establishing such areas is for the benefit of all citizens, it is necessary that adequate provision be made for public participation in the process of preparing detailed land use concept plans.

B1.3.10.5 Existing and Proposed Status

The existing status of the sites identified as Major Natural Areas varies enormously. Presently, they exist in Land Use Districts ranging from UR - Urban Reserve to I-2 - General Light Industrial. The sites are in both public and private ownership and of those in public ownership the land use codes vary considerably. In order to ensure their continued existence as natural areas, and in order that a common approach to their use and management can be made, it is desirable that these areas be given a common designation and that they are ensured of the greatest protection, for the purposes of preservation, that regulations allow.

Under the Land Use By-law a special district has been created for the purpose of providing for recreational, educational and conservation uses. It has been designated PE - Public Park, School and Recreation. Under The Planning Act, 1977, certain areas can be dedicated as Environmental Reserve (refer to Section B1.3.5.1).

The Major Natural Areas identified will cater predominantly, though not exclusively, to a variety of low intensity recreational uses. They clearly constitute a distinctive type of park, separate from the smaller, fragmented and less significant natural areas and from other major components of the City's parkland system.

The existing parks classification system contains a class for 'Natural Areas and Escarpments'. Within this class are areas over 20 acres (8 ha) in size, portions of which may be developed and transferred to other park categories. This class raises a number of problems with respect to Major Natural Areas. Not all escarpments are natural areas and five of the sites identified as Major Natural Areas are less than 20 acres (8 ha) in size. Also, the proposals of this plan require that Major Natural Areas be established and that any development taking place in such areas meet a number of preconditions. Transfer of a portion of any site to another park category would be unacceptable.

Presently, the Parks/Recreation Department is in the process of revising and reformulating the existing park classification system. It is evident that Major Natural Areas should be an integral component of any revised system. It should be noted that such a park class need not be restricted to natural areas as identified by the Calgary River Valleys Plan. Most of Calgary's natural areas are within the river/creek valleys and are covered by the Plan. However, in and adjacent to the city there are a number of other outstanding sites, some of which are of considerable size. Obvious examples are Nose Hill Park, the aspen parkland of Broadcast Hill, the riverine escarpment extending out to the Bearspaw Reservoir, the Weaselhead, the Priddis slough and numerous other sloughs which have considerable seasonal value for migrating waterfowl.

B1.3.10.6 Adjacent Land Uses

Where Major Natural Areas are presently surrounded by open space land uses, it is important that future development be of a compatible and, ideally, a complementary nature. The basic requirements are that no adjacent development be

aesthetically offensive or result either directly or indirectly in an impairment or loss of a natural area's existing quality.

Compatible land uses are discussed in Section B1.3.7.4 (iii). Basically, these are low intensity uses e.g. employment centres and light industrial/commercial sites, although transportation corridors are acceptable providing sufficient setbacks are provided. Complementary adjacent land uses would include land uses such as golf courses, cemeteries, and agricultural lands.

All but four of the Major Natural Areas identified are presently surrounded by undeveloped lands, low intensity uses, or higher intensity uses with considerable vacant land surrounding the sites. The generally low intensity of surrounding land uses is the primary reason why these sites remain as natural areas today. Brief examination of the four sites presently surrounded by developed land use indicates that while qualitative change has occurred, exceptional circumstances prevail in each case.

The area of flatlands surrounded on three sides by the west channel of the Bowness lagoon is contiguous with a row of single-family houses. It is undeveloped, being low lying, swampy, located in the Bow River floodway and separated from adjacent residences by a steep bluff. However, underbrush has been cleared and manicured lawns developed at the eastern and western extremities of the site (refer to Section B1.3.11.1.3). Elbow Island Park is surrounded by intensive land uses and has undergone significant deterioration. However, because it is located in the Elbow River and has not undergone formal development, it is still of considerable nature conservation significance (refer to Section B1.3.11.2.1). Both Bowmont Park and the Edworthy Park/Douglas Fir Escarpment/Lowery Gardens area are partially surrounded by development. Both sites were once absolutely first rate but have undergone considerable reduction in quality. In the case of the Edworthy complex, sufficient overall nature conservation significance remains to warrant a Class 1 rating (refer to Sections B1.3.11.1.4 and B1.3.11.1.5). The fact that both sites are very large, are not completely surrounded by intensive development and have only seen local development of facilities has been instrumental in ensuring that they have remained as natural areas of importance. It should be noted however that deleterious impacts have been occurring for only a short period of time. The long term effects on these sites are by no means clear at present.

None of the other Major Natural Areas identified are of comparable size to Bowmont Park and the Edworthy complex of sites. The development of intensive land uses adjacent to these sites would probably result in a decrease in value to such an extent that their nature conservation significance might be lost. Consequently, the establishment of a system of Major Natural Areas is only a first step. The ultimate fate of these areas is largely dependent on the manner in which adjacent lands are developed.

Essentially, almost any land use can be acceptable adjacent to natural areas providing proposals are sufficiently controlled and emphasis is placed on open space. In reality, this can be difficult to achieve. Lands presently coming under development in and adjacent to the city fetch a premium price. Consequently, any land owner may find it necessary to realize the maximum possible return on his investment. In practical terms, this usually translates into proposals for high intensity

uses, particularly residential uses which pose a great number of problems with respect to the continued viability of habitats when located immediately adjacent to natural areas.

When complementary or compatible land uses are proposed adjacent to Major Natural Areas, a combination of good design and sufficient development setbacks will ensure the continued viability of such sites. In the event of relatively high intensity uses being proposed, these measures may, of themselves, be inadequate and acquisition of sufficient surrourding lands to act as a 'buffer' may be necessary. "A Policy for Environmentally Sensitive Areas" (Parks/Recreation and Planning Departments) discusses a number of means whereby such areas can be acquired. With reference to buffer zones, there are four alternatives:

"(1) dedication by the developer as environmental reserve
(2) dedication by the developer as creditable reserve
(3) density transfer from the land and subsequent dedication by the developer as environmental reserve
(4) purchase by the City." (Page 15)

"A Policy for Environmentally Sensitive Areas" also discusses lands adjacent to environmentally sensitive areas (Page 14) and recommends that applicants for subdivision assess and minimize or eliminate the many potential impacts which may be associated with development when producing an Area Structure/Area Redevelopment Plan. This, together with recommendations contained in 'The Plan and Policies' part of this study, should be sufficient to ensure the continued preservation of Major Natural Areas.

It should also be noted that there are a number of management tools available to minimize recreational impacts. Limited access and fencing, as is proposed for the Nose Hill Park, is one legitimate option.

B1.3.10.7 The Acquisition of Major Natural Areas

It is desirable that the city's existing natural areas, as identified, be preserved. Recommendations concurring with the implementation are made in 'The Plan and Policies'. However, the manner of acquisition and the time scale involved vary considerably according to site specific circumstances.

In certain cases, and for a variety of reasons, it is conceivable that individual sites may suffer considerable qualitative reduction or even despoliation before acquisition in the normal course of events takes place. If this happens, the City has recourse to only two courses of action - to allow loss of the site to occur, or to acquire the site.

B1.3.10.8 Environmental Impact Assessment:

Calgary's Major Natural Areas in the river/creek valleys are not and cannot be immune to the threat of any type of future development. The strongest tool of environmental protection available to municipalities is the provision for Environmental Reserve - a provision under The Planning Act, 1977, and which recognizes the necessity of exempting "construction, installation and maintenance... of a public roadway or public utility" (Section 114a) from compliance with the terms of that provision of the Act.

No legislation can render a parcel of land completely inviolate and even in the case of National and Provincial Parks and Wilderness Areas, Crown or Federal rights to 'all mines or minerals' are commonly retained. The situation is exacerbated in the city where the necessity of maintaining a viable urban infrastructure requires constant modification and construction. With respect to

open space, transportation corridors pose the major threat. Undesirable as parks, natural areas or golf courses may be as routings for major thoroughfares, they may pose considerably less general public inconvenience than would construction through existing residential subdivisions.

The solution, at least in areas of land recently annexed by the City or in areas experiencing development for the first time, is advanced planning so as to allow development of an adequate transportation network, acquiring rights-of-way of sufficient width to permit future upgrading if and when necessary. This policy is presently being pursued by the Transportation Department. In currently developed areas, as expansion of the city results in increased pressures on existing services, upgrading of present thoroughfares and the creation of new alignments generally creates severe environmental impacts.

Problems with respect to the above scenarios will inevitably continue to exist but can be minimized. The basic public concerns can be addressed appropriately through public participation and by making decisions which are justifiable.

The Major Natural Areas identified constitute highly significant environmental resources in the Calgary region, and the public have repeatedly indicated that these resources require preservation. An effective means of facilitating public acceptance of any development proposal affecting a natural area is to ensure that all legitimate concerns are addressed prior to implementation. This requires that the current environmental amenities and values be given appropriate consideration in decision-making along with economic and technical considerations. The tool by which this can be achieved is the environmental impact assessment (E.I.A.)

Alberta's Land Surface Conservation and Reclamation Act (1973, Chapter 34, amended 1976) provides for the Minister of the Environment to require preparation of an E.I.A. report by the proponent (public and/or private) to assess the impact of any operation or activity which will or is likely to result in surface disturbance. The Minister assessment of impact in any or all of a number of instances, including:

> "-the conservation, management and utilization of natural resources.
> -the preservation of natural resources for their aesthetic value."

Provincial Environmental Impact Assessment Guidelines (Alberta Department of the Environment, Feb. 1977) contain the following statements:

> "The Government of Alberta is committed to achieving a balance between resource development and environmental quality." (Section II, Page 1.)

> "The responsibility and cost for the preparation of E.I.A. reports rests with the proponent of the development. Government departments and agencies with responsibilities for the construction and operation of capital works will be required to prepare and submit E.I.A. reports in accordance with these guidelines." (Section III, Page 1.)

> "Recommendations to the Department of the Environment that an E.I.A. report be requested may emanate from a variety of sources such as the public or elected representatives at the local or provincial levels, or other government departments and agencies." (Section VII A, Page 9.)

Provincial guidelines establish the format and content of E.I.A. reports. Some flexibility in emphasis is imperative as the salient implications arising out of specific project proposals are variable. With respect to the Major Natural Areas existing in Calgary's river/creek valleys, two items require special attention, the assessment of environmental impacts and public concerns:

a. Assessment of Environmental Impacts: In accordance with established guidelines, E.I.A. requires identification of all major potential impacts as they relate to nine environmental parameters. These include the following biological and physical parameters: geology, soils, vegetation, fauna, water and air. It is important that within this framework each of the biological and value-based evaluatory criteria identified as being integral to the assessment of the value of Major Natural Areas (refer to Section B1.3.7), be addressed.

b. Public Concerns:

Under The Planning Act, 1977, a council or a council and a school authority may authorize

"(a) the construction, installation and maintenance or any of them of a public roadway or public utility, on, in, over or under reserve land, or

(b) the maintenance and protection of reserve land,

if the interests of the public will not be adversely affected." (Section 114)

notwithstanding Sections 107 to 113 of the Act.

Section B1.3.6 itemizes public concerns relating to natural areas and indicates that a high value is placed on them. Further, Section B1.3.7.3 notes that natural areas have no intrinsic value and that their significance is equal to their perceived importance. Accordingly, assessment of identifiable biological physical impacts of development must be based on the public good. It is evident that it is in the interest of the public that natural areas, as identified, be preserved. Presumably, it is also true that public utilities are proposed for the public good. Consequently, in cases where potential incompatibility exists between conflicting public goods a fundamental task of any E.I.A. report must be to establish the relative priorities involved and make recommendations accordingly.

B1.3.10.9 Interpretive Potential

Aesthetic quality and educational and interpretive potential have been identified as three major advantages accruing from the retention of natural areas (Section B1.3.3.1(i) (iii) (v)). In order to fully complement the range of recreational opportunities existing in other components of the river/creek valleys open space system, these advantages should be fully and suitably utilized. The potential role that individuals can play in this process is discussed in Section B1.3.10.10 below.

A number of clear opportunities for specific action can be identified. In many areas, self-guiding nature trails are extremely successful and there is considerable variety in the type of such trails in existence. Visitors can pick up an interpretive leaflet and follow a marked trail. In this manner, the trail user can be informed of such things as the identity of trees, the features visible from scenic outlooks, geological features and geomorphological processes. Alternative trails of varying lengths can be identified by the simple expedient of coloured bands on posts marking the trails. Wherever feasible, trails should be laid out in such a manner that they can be utilized by cross-country skiers in winter.

Interpretive centres can fulfill a variety of functions. When located in regional parks adjacent to natural areas, the centre can contain exhibits relating to both.

Considerable potential for informal education exists among Calgarians. Occassional nature trails can be organized for various school grades, utilizing the professional expertise of Parks/Recreation staff, teachers and volunteers such as members of the Calgary Field Naturalists' Society.

B1.3.10.10 Supervisory Management

The Environmental Inventories produced in connection with this report are adequate for the purpose intended and provide a good overview of Calgary's natural areas in the river/creek valleys. Reports published by the Calgary Field Naturalists' Society are more comprehensive but presently cover only a limited number of Major Natural Areas which have had high public exposure. Therefore, there is a lack of accurate, high quality, up to date data concerning habitats, communities and species in Calgary's natural areas. Such data is required before the true value of the areas can be understood.

There is also a lack of effective 'maintenance' in natural areas and policing is effectively non existent. Locally, natural areas experience problems of over-use and abuse but natural areas throughout the river/creek valleys are underutilized in their potential for nature study and education. Few citizens are aware of the quality and variety of natural environments existing in their city and of the recreational potential that these environments offer.

The establishment of a formalized system of Major Natural Areas has numerous management implications. Some of the more obvious needs and opportunities arising are briefly identified as follows:

Needs - Considerable research with a strong emphasis on field work is necessary in order to improve our knowledge regarding the location, number and distribution of species, communities and habitats existing in natural areas. The implications of this information for both management and use will require identification and assessment. Natural areas require supervision and maintenance. Litter needs to be picked up, trails require regular maintenance and the activities of recreationists need careful monitoring, particularly where fragile areas are concerned. Liaison with the Police Department is advisable. "Master planning" is required to determine the appropriate level of facility provision and work crews require careful supervision. Displays in the proposed interpretive centres require production and supervision.

Opportunities - Public awareness of natural areas may be increased through liaison with schools and community organizations and be further promoted by the organization of interpretive nature walks. Detailed information may be acquired by encouraging and co-ordinating the research

activities of interested individuals and groups, e.g. university and college students and the Calgary Field Naturalists' Society.

In order to carry out the above tasks most effectively, the allocation of considerable resources are required on a continuing basis. The Major Natural Areas are a new component in the existing open space system in the river/creek valleys and in order that a unified approach can be undertaken in matters related to their use and management, it is preferable that necessary future resource management studies be conducted internally by the Departmentsaffected. Implementation of individual projects on an ad hoc basis is ultimately inefficient in that only a portion of the complete task is addressed, namely the collection of data and the formulation of recommendations for a specific site. Consequently, it is difficult to establish a consistent approach and there is no cumulation of experience and knowledge amongst those directly involved in implementation and ongoing administrative, maintenance and interpretive tasks. This is particularly true in the case of natural areas as application of the evaluatory criteria identified must be consistent.

A further management consideration relates to the desirability of employing regionally based personnel. The needs and opportunities identified above may be effectively addressed on a site specific basis and within a regionally defined collection of sites. It is logical to have personnel in a spatially defined unit where they can be involved in data collection and the co-ordination and execution of interpretive and other public awareness programs. Organization according to this format would also complement the existing Departmental administrative infrastructure with its emphasis on area managers.

The requirement for specialized personnel to fulfill the needs and opportunities itemized above focuses on naturalists. Presently, the City employs a single naturalist. The specialized contributions of naturalists in association with existing Departmental personnel would probably provide the required resource capability to conduct the required studies. Additionally, their detailed knowledge of individual sites would be an integral part in the successful evolution of interpretive and other public awareness/involvement programs.

B1.3.11 MAJOR NATURAL AREAS: SITE SPECIFIC CONSIDERATIONS

This section individually examines each Major Natural Area. Each site is selected from the lists of Environmental Resource Features identified in the Environmental Inventories ('Land Use Inventory and Analysis' - Sections A3, B3, C2 and D2) and fulfills each of the criteria established for the identification of natural areas (areas of open 'green space' more than 5 acres (2ha) in size predominantly covered with indigenous vegetation, lacking substantial modification by man, not in active farmland use and containing indigenous fauna). Sites are listed according to location, upstream to downstream for the Bow and Elbow Rivers and West Nose Creek respectively. The purpose of the section is twofold.

Firstly, each evaluatory ranking is explained and justified by relating information from the Environmental Inventories to the various evaluatory criteria identified in Section B1.3.7 (size, diversity, naturalness, rarity, fragility, typicalness, seasonal value, recorded history, position in an ecological/geographical unit, potential value, intrinsic appeal and the presence of natural physical features).

Secondly, the constraining criteria (developability and economic value, ownership, the nature of surrounding land uses, probable intensity of use and accessibility) are discussed in detail and the implications and opportunities arising therefrom are identified.

In making the site-specific recommendations in Section C1.1.4.11 of 'The Plan and Policies', particular emphasis was given to the desirability of leaving management personnel with the widest possible range of options. The recommendations are not a substitute for and do not preclude management discretion or on-site design. Rather, they establish the framework within which these may take place.

It is emphasized that all recommendations pertaining to specific sites must be viewed within the context established by the General Recommendations in Section C1.1.4.2 in 'The Plan and Policies'.

B1.3.11.1 The Bow River:

By far the greatest number of natural areas within the study area are situated adjacent to the Bow River. Thirteen sites have been identified as Major Natural Areas.

In general, the Bow River sites are relatively large - only four are less than 20 acres (8 ha) in size and none are smaller than 10 acres (4 ha).

B1.3.11.1.1 The riverine escarpment on the right bank of the Bow River extending west from approximately the 33 Avenue N.W. alignment (B1)

The western boundary of the site as indicated is somewhat arbitrarily defined, coinciding with the approximate point where the escarpment decreases significantly in grade and the dominant vegetation gives way to Aspen Poplar from White Spruce. The boundary indicated therefore denotes a change in community and physiography and is not the boundary of the natural area which continues westward where the riverine escarpment again becomes very well defined with a dominant vegetation growth of White Spruce. The whole area is of outstanding nature conservation significance and has enormous aesthetic value.

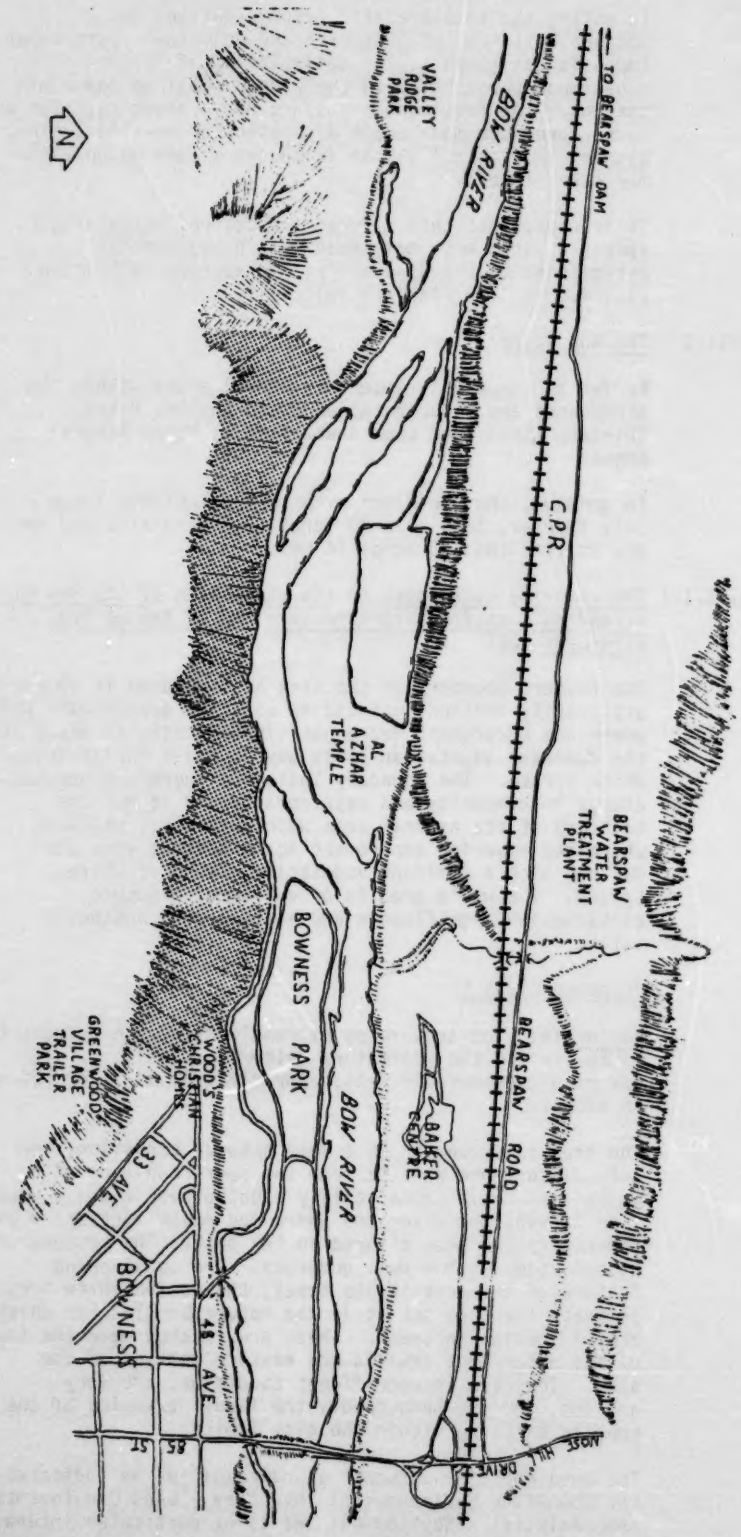
Proposed Class 1

Rationale: The area rates extremely high with respect to virtually all the evaluatory criteria identified. It covers a considerable area, approximately 64 acres (26 ha) in extent.

The area is presently in a very natural condition; the only disturbance results from the poor condition of a major dirt trail and a utility right-of-way where a power line crosses the river and where the major vegetation and understory has been cleared in the past. The process of regeneration is now well underway. The outstanding feature of the area is its trees; the native White Spruce dominate the area but it is the mature Douglas Fir which are of special interest. These are located near the top of the escarpment towards the eastern portion of the site. They are in magnificent condition, are very ancient, and are undoubtedly the finest examples of the species existing within the city limits.

The area contains a number of rare species as indicated in the Bow River Environmental Inventory ('Land Use Inventory and Analysis' - Section A3) and is of particular interest to ornithologists. The undergrowth is very fragile and susceptible to damage by trampling. The site is typical of the vegetation existing on north-facing escarpments on

Site B1


N
TO BEARSPAW DAM
VALLEY RIDGE PARK
BOW RIVER
C.P.R.
AL AZHAR TEMPLE
BEARSPAW WATER TREATMENT PLANT
BOWNESS PARK
BOW RIVER
BEARSPAW ROAD
BAKER CENTRE
GREENWOOD VILLAGE TRAILER PARK
WOOD'S CHRISTIAN HOMES
53 AVE
BOWNESS
48 AVE
58 ST
85 ST
NOSE HILL DRIVE

the Bow River in the Calgary area. It is the best example of only two such sites in the city. Aesthetically, the area is extremely attractive and the undeveloped, open character of contiguous and adjacent lands considerably enhances the quality of its visual setting.

Constraining Factors: At present, this area receives only occasional use from hikers, fishermen and naturalists. Children from the Wood's Christian Homes and from trailers on Tri-Media land at the top-of-the escarpment also use the area. Although the whole area is private, access is possible.

Adjacent lands have considerable development potential. An outline plan has been submitted for a proposed residential subdivision abutting the top-of-the escarpment. Tri-Media are also considering a residential component on a portion of their land. The proposed North West Bypass (Stoney Trail) alignment passes through this area, utilizing an existing utility right-of-way.

The area is reasonably accessible only to people living in a portion of Bowness to the west of 85 Street N.W. and north of the Bowfort Road, and to the residents of Greenwood Village Trailer Court. Access is good from Bowness Park, which is readily accessible via Bowness Road and Nose Hill Drive (85 Street N.W.), and from the Tri-Media site which is accessible from the Trans-Canada Highway.

Approximately 14% of this area, a portion of the riverine forest adjacent to the west channel of the Bowness Lagoon, is within the floodway.

Implications and Opportunities: Future development, probably residential in nature, can be expected to take place adjacent to this site. There is no doubt that if comprehensive development takes place without the necessary constraints the outstanding natural qualities of the area will be lost and its value as a natural area significantly reduced. Potential impacts can be minimized by careful planning and sufficient setbacks. However, without physically limiting access, it will not be possible to prevent the occurrence of the type of progressive impairment which has affected the Douglas Fir Escarpment in Edworthy Park.

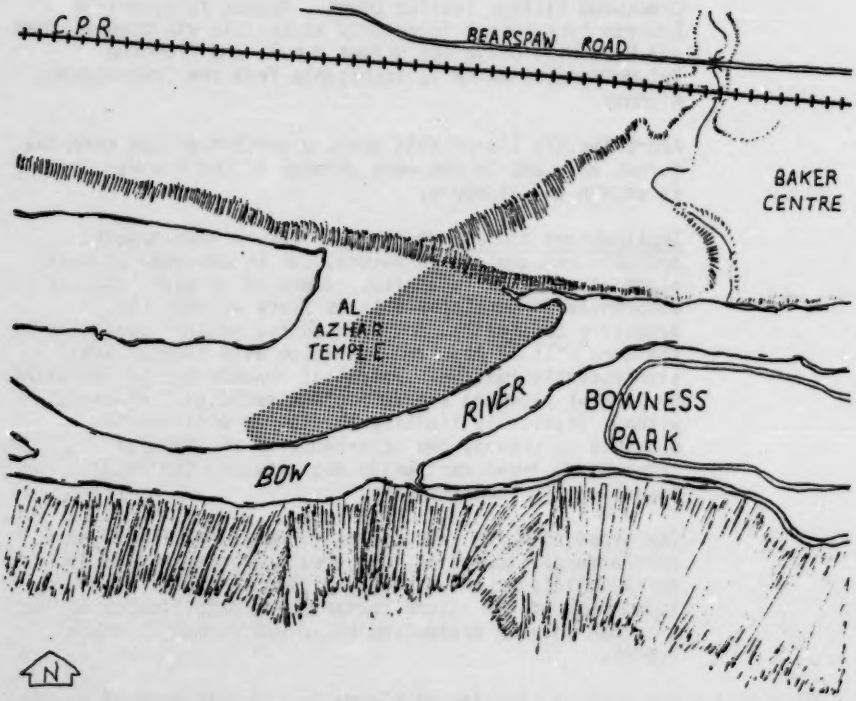
The proposed North West Bypass (Stoney Trail) will have environmental impact on this area. Adverse visual and noise impacts of the expressway and the extent of impairment of the nature conservation significance of the area can only be determined by an environmental impact report.

B1.3.11.1.2 The area of riverine flatlands on the left bank of the Bow River opposite the western extremity of Bowness Park (B2)

Proposed Class 3

Rationale: The area, owned by the Al Azhar Temple, is small (14 acres/5.5 ha) and occupies a low lying gravel bar located in the floodway. It supports a restricted number of species. There is some disturbance on the landward side where there are trailers located in the trees. Otherwise, it is in a natural state and receives very little use. The vegetation on much of the site is low lying and very susceptible to trampling. It is contiguous with a broad stand of Balsam Poplar riverine forest which extends westwards along the left bank of the Bow River. The site is notable primarily for its aesthetic qualities, contributing to the pleasing open space ambience of Bowness Park and the major escarpment on the opposite riverbank. It is also a breeding ground for waterfowl.

Site B2


C.P.R.
BEARSPAW ROAD
BAKER CENTRE
AL AZHAR TEMPLE
RIVER
BOWNESS PARK
BOW
N

Constraining Factors: Development of a residential subdivision may be expected to take place in the near future in Scenic Acres but this is far removed from the site. The site is about 4,800 ft. (1,460 m) from 85 St. N.W. and is separated from the Bearspaw Road by the C.P.R. tracks and privately owned farmland. Apart from the Al Azhar Temple site to the north west and the Provincially owned Baker Sanatorium to the east, surrounding lands are undeveloped. The site is readily accessible only from the Al Azhar Temple site and an adjacent community building. Present intensities of use pose no threat to the natural qualities of this area although children occasionally make their way along the left bank, posing a threat to nesting waterfowl in the spring.

This site lies almost entirely within the floodway and it may be affected by the proposed North West Bypass (Stoney Trail).

Implications and Opportunities: Because of the site's small size and fragility, general public access would result in a significant loss of the site's nature conservation significance.

The site lies within the Provincial utility corridor established by the Province. Should it be affected by the North West Bypass (Stoney Trail), a detailed study will be required in order to accurately evaluate the quality of this site and the degree of impairment that construction would cause.

B1.3.11.1.3 The area commencing at approximately the 33 Ave. N.W. alignment - bound on the west, north and east by the west channel of the Bowness Lagoon and on the south by the riverine escarpment (B3)

Proposed Class 2

Rationale: The area is small (9 acres/3.5 ha) but has a well developed understory and a considerable diversity of species. Major vegetation consists of isolated White Spruce and Balsam Poplar. Habitat value is enhanced by the marshy nature of much of this site. The undergrowth is very fragile. The area is in multiple private ownership, is fenced off and receives virtually no use. It is in a very natural state with the exception of the eastern and western extremities where the undergrowth has been cleared and a manicured lawn developed.

This site is contiguous with both the riverine flatlands and major escarpment to the west. It is of very high aesthetic quality which adds significantly to the enjoyment of users of the red shale path in Bowness Park on the other side of the west channel of the lagoon.

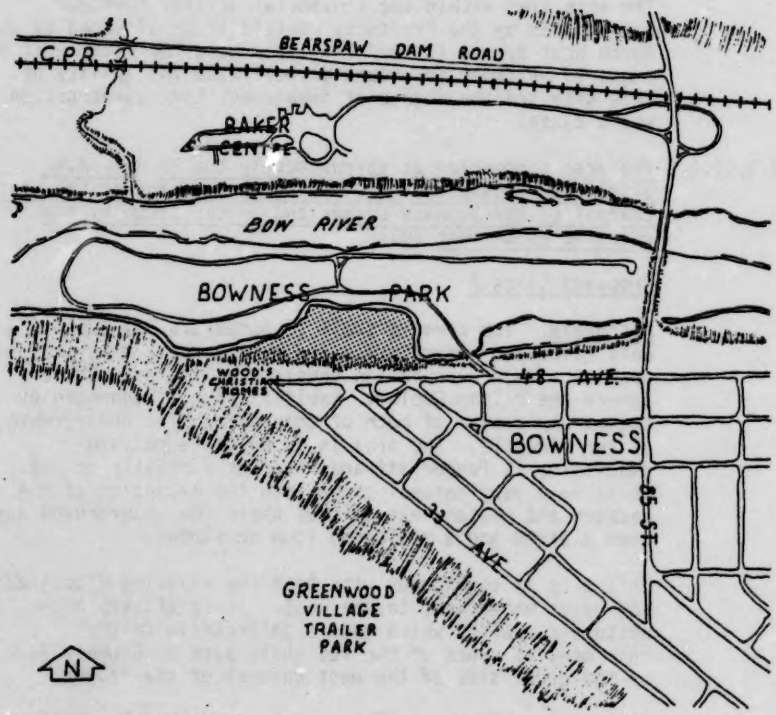
Constraining Factors: The area is inaccessible to the general public and use is minimal. It is surrounded on three sides by Bowness Park and to the south by single family residences on 48 Ave. N.W. The owners of the land presently retain this area in its natural state.

The entire site is within the floodway.

Implications and Opportunities: Because of the area's small size and fragility, general public access would inevitably result in a significant loss of the site's nature conservation significance. Public regional open space requirements are presently satisfied by Bowmont Park and Bowness Park.

Although the present owners retain this land in its natural state, the situation could change overnight. Neither the City nor the Province has the means of securing the preservation of natural areas in private

Site B3


BEARSPAW DAM ROAD
C.P.R.
BAKER CENTRE
BOW RIVER
BOWNESS PARK
WOOD'S CHRISTIAN HOMES
48 AVE.
BOWNESS
85 ST.
33 AVE.
GREENWOOD VILLAGE TRAILER PARK
N

ownership. Consequently, acquisition by the City for the express purpose of preservation provides the greatest assurance that this will be achieved.

B1.3.11.1.4 Bowmont Park(B4)

Note: The Parks/Recreation Department engaged a consultant to prepare a "master plan" for this park. The consultant, Lombard North Group, prepared alternative proposals for the Parks/Recreation Department. Meetings with the adjacent communities were held to discuss various alternative proposals. Although no specific decisions have been made, the communities affected opted for the alternative that favours the retention of major parts of the park in their natural state.

Proposed Class 2

Rationale: The area is large, approximately 334 acres (135 ha) in extent (excluding the large island opposite Bow Crescent). It is the second largest natural area existing within the city.

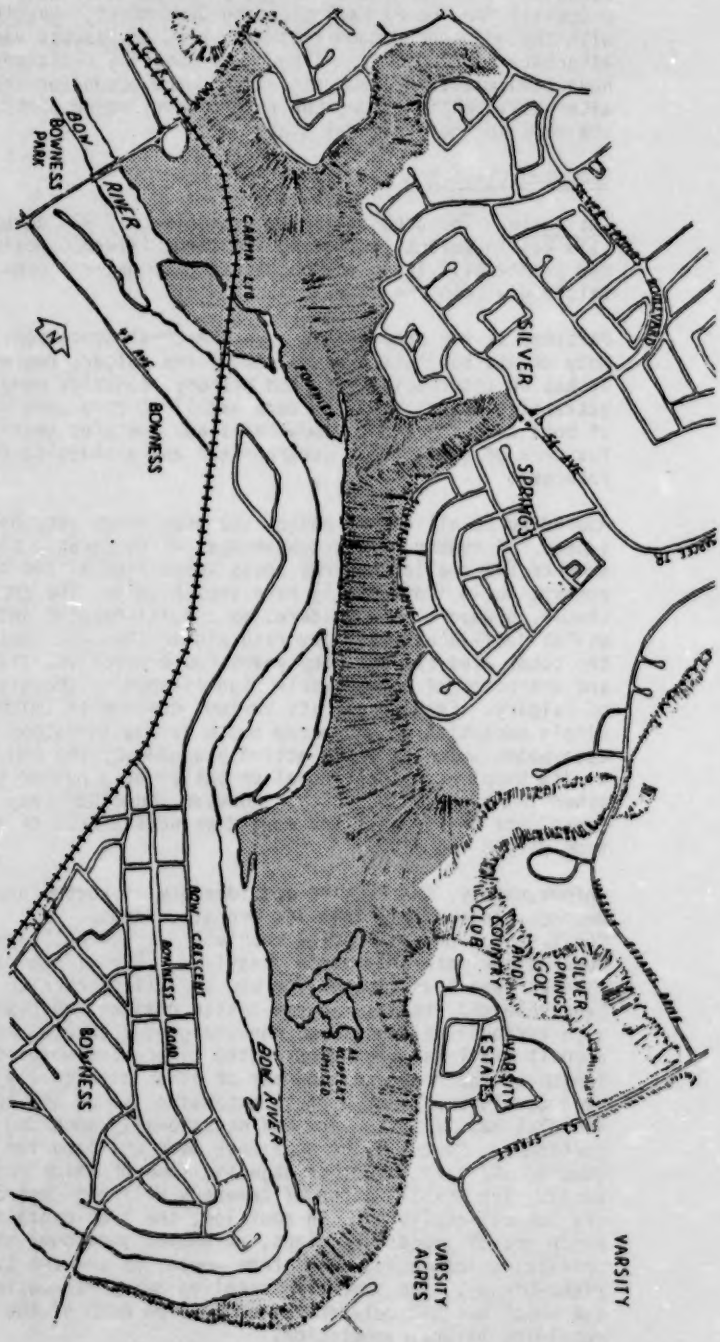
Portions of the area are in a very natural condition. Many of its habitats are typical of the Calgary region. It has an interesting recorded history, contains many attractive areas, provides some excellent panoramic views of both the city and the mountains and contains several features of geological, geographical and archaeological interest.

According to all of the above, the area rates very highly indeed. A number of its components, of comparable size to some of the smaller natural areas identified within this report, would individually rate very highly. The area should, however, be considered as a multi-faceted unit. Whilst individual parts may rate higher than the whole, the total area has for many years had a perceived status and character of considerable significance to the citizens of Calgary. Fragmented, its various components (with the single exception of the steep south facing sandstone escarpment which is being actively eroded by the Bow River at its base) have their equal or better at a number of other locations in the city. However, together they constitute the largest and most distinctive area of its type within the city.

Unfortunately, the area is considerably disturbed and this detracts appreciably from its overall status. Construction of residential subdivisions has destroyed much of the natural prairie grassland. Two of the major ravines have been altered for use as utility corridors, been reseeded with coarse non-native grasses and planted with various indigenous and non-indigenous trees. An asphalt trail has been constructed throughout most of the length of the area and a number of other dirt trails have been developed. In the past, extensive use of off-road vehicles has left its mark and occasionally such use continues. Parts of the area have been utilized for dumping old cars and other objects, some of which remain today. The stabilization of Cemetery Hill has destroyed its natural qualities. In addition, the area contains a major gravel processing plant, an unused snow dump site, a private residence and road, tree nurseries and the C.P.R. right-of-way. The area also receives heavy recreational use which has had deleterious effects on much of the remaining natural vegetation.

Individually, none of the above causes of disturbance significantly impairs the value of this area. Many have had only relatively short term effects leaving the potential for regeneration under ideal conditions but, together, they significantly impair the present and future nature conservation significance of this site.

Site B4 - Bowmont Park



Constraining Factors: A City transportation option for the possible future extension of existing roadways directly affect this area - north/south Sarcee Trail.

The diversity of present land use is reflected in the fragmented ownership of this area. Residential development in immediately adjacent areas has reached its probable maximum extent but recreational use of the area can be expected to continue to grow. Present access to the area is good from 85 St. N.W., and Crowchild Trail and Bowness Road via numerous local roads. However, pedestrian access for residents of Bowness, most of whom live closer to this area in terms of direct distance than Bowness Park, is poor.

The communities of Silver Springs, Varsity Acres and Montgomery are situated immediately adjacent to this area. The community of Bowness occupies the entire right bank of the Bow River opposite this site. Development of a residential subdivision may be expected to take place in the near future at Scenic Acres on the west side of 85 St. N.W. adjacent to Silver Springs.

This is one of two sites within the city proposed for Major Natural Area status which is presently a city park (though less than half the total site is presently designated as park).

Approximately 27% of this area is situated within the floodway.

Implications and Opportunities: It is emphasized that the purpose of itemizing the above contraints, sources of disturbance and land uses which adversely affect the status of the site is to depict the situation as it exists. This situation imposes certain constraints and creates certain opportunities with respect to the future status and possible use of the area. Paradoxically, some constraints which detract from the nature conservation significance of the area create opportunities for recreational use. Inclusion of this site as a Major Natural Area is a clear indication of the importance attached to its natural values and the direction and emphasis which should be taken in determining the ultimate use of this major resource. Within the clear constraints thereby imposed, there exists great potential for the selective development of this area on a site-specific basis to provide a diversity of recreational opportunities for the people of Calgary.

The existence of fragmented ownership in this area is a continuing obstacle to optimizing public use and developing a comprehensive approach to site development which will allow retention of the area's nature conservation significance. Following an Operations and Development Committee resolution in October 1979, City Council approved a policy of active acquisition for public park purposes of the three privately owned parcels of land existing within Bowmont Park: the Al Klippert Ltd. lands, the Carma Development lands, and the L.H. Fournier lands. The land acquisition question has been referred to the Land Committee for preparation of an active acquisition strategy.

The existence of the C.P.R. tracks in this area poses certain problems regarding future use of this area which must be suitably resolved.

B1.3.11.1.5 The Edworthy Complex: The escarpment west of Edworthy Park, Edworthy Park, the Douglas Fir Escarpment and Lowery Gardens (B5)

Note: The morphology, ownership and habitat variation within this site are such that it may be considered as comprising four large sites - the escarpment west of

Edworthy Park, Edworthy Park, the Douglas Fir Escarpment, and Lowery Gardens. However, the sites are contiguous, closely related, and numerous species move freely between the various components. The whole area functions as a unit and is, therefore, logically considered as such.

The Parks/Recreation Department has undertaken to have a "master plan" prepared for the area in 1981.

Proposed Class 1

Rationale: The area comprises approximately 577 acres (233.5 ha) and is by far the largest natural area identified within the study area. Much of this area is in a natural state but there exist a considerable number of local sources of disturbance. There are two country residential homes on the escarpment to the west of Edworthy Park. and the natural vegetation in the surrounding areas has been cleared. There are a number of dirt and vehicle trails and an access road leading into the area from Spruce Drive.

Edworthy Park contains a number of facilities (itemized in the Bow River Environmental Inventory in the 'Land Use Inventory and Analysis' - Section A3) and considerable portions of land are no longer in a natural state, notably much of the Bow River floodplain, land adjacent to the access road and a portion of the grassland at the top of the escarpment. However, much of the grassland is in a natural state and the escarpment adjacent to the Pawnee Lookout trail and much of the major ravine contain high quality natural environments, contiguous with the natural areas on either side of the park.

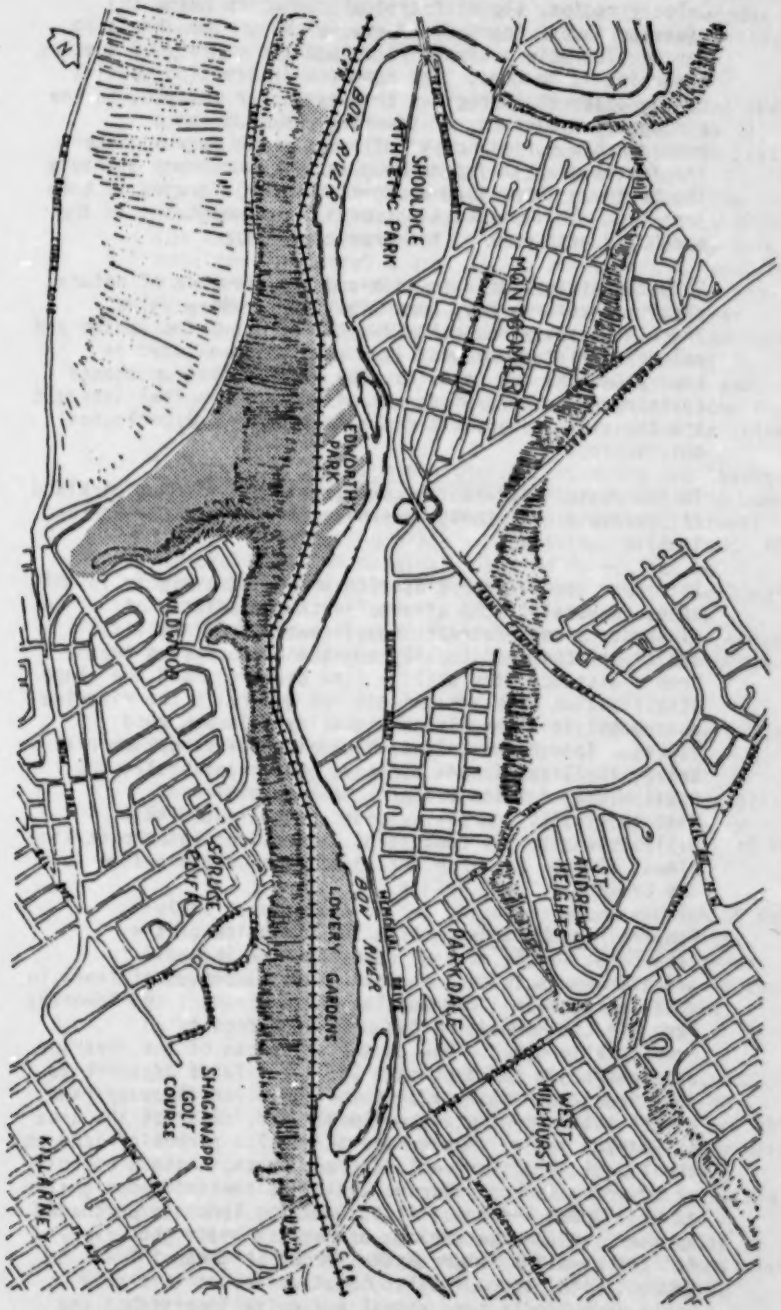
On the Douglas Fir Escarpment, the main dirt trail requires considerable maintenance and portions are in varying states of disrepair. Where the trail zig-zags, short-cuts have resulted in considerable damage to vegetation adjacent to the trail and have contributed to slope instability, a problem which exists throughout this area due to the existence of numerous seepage springs on the face of the escarpment. In one area, slope stabilization has taken place resulting in a loss of nature conservation significance. Away from the trails, considerable damage to the vegetation of the area, particularly the more vulnerable types of undergrowth, can be observed and is attributable primarily to the widespread use of this area as an adventure playground by local children. It should be noted that during the winter of 1979/80, a girl died of serious injuries resulting from tobogganing at this location. In view of the foregoing, a sign should be erected warning against the potential danger related to recreational activities on these steep slopes.

A large portion of Lowery Gardens has been disturbed in the past and much of the Balsam Poplar riverine forest cover has been removed. The Shaganappi ski slope bisects the escarpment east of this area.

The C.P.R. mainline tracks parallel the base of the riverine escarpment throughout this area.

Despite the relatively high degree of localized disturbance, the nature conservation significance of this area is very great. This is due primarily to its size and the variety of habitats which it contains. In isolation, none of the individual components of this area rate in the highest evaluatory category. Together, they constitute one of the most significant natural areas in the Calgary region. The area contains marshes and aquatic habitats, riverine forest, a forested north-facing escarpment, aspen shrub and grassland which support an impressive array of species. According to the Calgary Field Naturalists' Society (see the Bow River Environmental Inventory in the

Site B5 - The Edworthy Complex



'Land Use Inventory and Analysis' - Section A3) this area, excluding the escarpment to the west of Edworthy Park, contains almost 300 species of flowering plants and over 100 species of birds have been sighted here. Additionally, under proper management, the majority of disturbed sites have considerable potential for the regeneration of natural vegetation.

The site contains a number of species common to the Calgary region, the most typical community being the riverine forest found in Lowery Gardens. The area also has considerable seasonal value and the variety of species occurring is so great that numerous interesting species can be observed throughout the year. For example, in the spring the grasslands of Edworthy Park support a considerable variety of wildflowers while in the winter, the forested north-facing Douglas Fir escarpment attracts the Northern Three-Toed Woodpecker which migrates to this area from the forested high cordilleran mountains in the north and west part of the province.

Both the history of this area and the presence of natural physical features have potential interpretive value. The old Edworthy House in Edworthy Park and the varied and colourful history of past land uses which existed in Lowery Gardens are notable. The abandoned river channel containing the Sora Slough is of geomorphological interest and the steep escarpment contains a number of geological outcroppings.

To the west, this area is contiguous to the aspen parkland of Broadcast Hill though separated from it by the Sarcee Trail.

Intrinsic appeal is a criterion which rates highly in this area. Generally, the adverse aesthetic effects of disturbance only detract significantly from the visual quality of the area locally and the neighbouring areas. From a distance, the utility line crossings and the slope stabilization site are evident but generally the riverine escarpment is of high visual quality. It has good exposure from Bowness Road, Parkdale Boulevard, Memorial Drive, the Trans-Canada Highway, Shaganappi Trail, the Point Mackay development and the communities of Montgomery, St. Andrews Heights, Parkdale and West Hillhurst, visually dominating the entire southern skyline almost all the way from the west Trans-Canada bridge to the Crowchild Trail bridge.

Constraining Factors: With the exception of the escarpment to the west of Edworthy Park which is in private ownership, the whole area is comprised of lands in public ownership. The Douglas Fir Escarpment and Edworthy Park are City-owned, whilst Lowery Gardens is Provincially-owned. Due to the steepness of the riverine escarpment and the fact that low-lying lands adjacent to the river are largely within the Bow River floodway (and almost entirely within the floodplain), most of the area is undevelopable. However, a triangular parcel of land at the top of the escarpment adjacent to the western boundary of Edworthy Park and Sarcee Trail, is presently designated as UR - Urban Reserve. Also, Edworthy Park was purchased by the City for the purpose of retaining a right-of-way for the possible future extension of Shaganappi Trail to connect with Sarcee Trail. Construction of this road would undoubtedly have visual and noise impacts but the ultimate effect upon the area's nature conservation signficance and public enjoyment can only become evident following a detailed impact assessment of the project.

A variety of land uses surround the area. The western portion is bound by the Sarcee Trail and future residential development may occur on the opposite side of this roadway. The eastern part of Edworthy park and the western portion of the Douglas Fir escarpment are

immediately adjacent to the community of Wildwood, while the eastern portion of the escarpment abuts the community of Spruce Cliff. The housing is predominantly single-family with some condominiums. Residential development adjacent to the natural area appears to have reached its maximum extent. Lowery Gardens is separated from Spruce Cliff by the riverine escarpment and the Shaganappi Golf Course. Intensive land uses dominate the opposite riverbank. The extreme western portion of the area is opposite Shouldice Athletic Park whilst the remainder faces the Point Mackay development and the communities of Parkdale and West Hillhurst.

Access to the area is variable. The escarpment to the west of Edworthy Park receives few trespassers as it effectively leads to a 'dead end' bound by Sarcee Trail and the Trans-Canada Highway. Lowery Gardens is accessible via the Shaganappi Golf Course, down the escarpment from Cedar Crescent or via a long walk along the westerly extension of 9 Avenue S.W. Edworthy Park receives considerable use. It is accessible by vehicle via Spruce Drive and convenient pedestrian access from Montgomery and Point Mackay exists via the Boothman pedestrian bridge. Use is concentrated in the developed portions of the park. The Douglas Fir Escarpment is accessible from Edworthy Park and Lowery Gardens and direct point access exists at a number of locations on Wildwood Drive and from 37 Street S.W. and Spruce Drive.

Implications and Opportunities: Continuing low levels of use on the escarpment west of Edworthy Park and in Lowery Gardens can be expected. The process of vegetational succession is taking place on the latter site though it is doubtful that the original riverine forest can be regenerated in full. In Edworthy Park and on the Douglas Fir Escarpment, relatively high levels of use are established and appropriate management action is necessary to promote the regeneration of vegetation on disturbed sites.

In areas which are presently unattractive and where the regeneration of natural habitats is not feasible, landscaping is required. The area requiring most attention is the soil stabilization site on the Douglas Fir Escarpment, presently an artificial and visually sterile swathe of land which severs the continuity of the riverine escarpment.

Future development on the privately owned portion of this area would result in a further reduction in quality. Eventual acquisition of private lands for the express purpose of retention as part of the natural area is the most likely means of ensuring preservation of this resource for the benefit of the people.

The location of the C.P.R. tracks throughout this area poses an obstacle to public access and a continuing potential hazard to recreationists. Acquisition of this land is not a practical possibility since it is the main railway line. Acquisition would be prohibitively expensive and because of the generally developed nature of surrounding land uses, relocation of the line would undoubtedly create more serious problems than exist at present. However, it is necessary that the inconvenience and dangers associated with the existing routing be minimized.

Edworthy Park presents something of an anomaly within the natural area. While certain portions of this park are in a very natural state, other parts are developed as a major regional park and cater predominantly to a variety of family oriented recreational activities. The closest alternative parks within the Bow River valley providing for this type of use are Bowness Park and Prince's Island.

Inclusion of the developed portion of the park within the natural area would either compromise the integrity of the natural area or necessitate cessation of the type of recreational use which presently exists in order that the regeneration of natural habitats might occur, a process which would probably take a great number of years and severely restrict the variety of recreational opportunities presently available. Neither position is defensible. Fortunately, with the exception of the access road, provision of facilities catering to intensive types of recreational activity are restricted to that portion of the park which is located on the inside of a river meander, predominantly to the north of the C.P.R. tracks and predominantly within the Bow River floodplain. Elsewhere, extensive disturbance is limited to a linear site extending up the riverine escarpment and across the grasslands to the Sarcee Trail. This disturbance resulted from the installation of sewer and water utilities in 1976 and 1977 to service the new residential community of Coach Hill.

Satisfaction of the varying recreational demands and opportunities existing in this area can best be achieved by establishing the majority of Edworthy Park as a natural area and retaining the presently developed portion of the park as a major regional park. The base of the riverine escarpment is the approximate division between the developed and natural portions of Edworthy Park. The Parks/Recreation Department is unadertaking to prepare a "master plan" for the Edworthy area in 1981. Delineation of the boundary line between the two park classes can be most appropriately made at that time. Recommendations made in Section C1.1.4.12 of 'The Plan and Policies' are sufficient to ensure the continued preservation of important natural habitats existing in the developed portion of the park immediately adjacent to the river.

B1.3.11.1.6 The Inglewood Bird Sanctuary (B6)

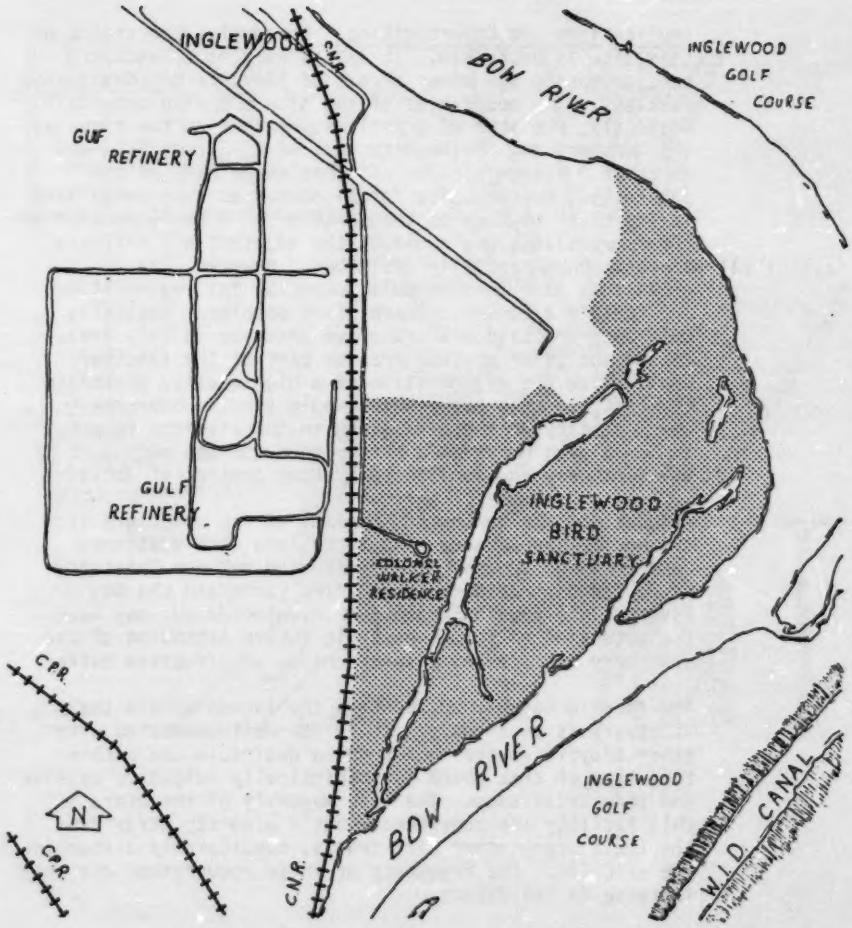
Proposed Class 1

Rationale: The area is large, comprising approximately 60 acres (24 ha). Most of the area is in a very natural state although there is some limited facility provision as itemized in the Environmental Inventory (refer to the 'Land Use Inventory and Analysis'). A bicycle trail is located adjacent to the lagoon. Elsewhere there are dirt or wood chip trails.

According to the Calgary Field Naturalists' Society, 1979 figures indicate that 259 species of vascular plants have been recorded for this area along with 222 bird species. The area is fragile only locally and can withstand present levels of use. A number of very rare species have been sighted here. Amongst the plants are the High-bush Cranberry, which is found only at this location within the city, the Purple Loosetrife, which is recorded nowhere else in Alberta, and the Marsh Forget-Me-Not which is probably not found elsewhere in the province. Rare birds include the Canada Warbler and Harris Sparrow and there have been exceptional sightings of such species as the Iceland Gull and the Barred Owl.

The Balsam Poplar riverine forest which covers most of the site is typical to the Calgary region and one of the best examples existing within the city. The area has considerable seasonal value and is noted for the variety of birds which collect there during the fall migration. The annual gathering of migrating warblers is unsurpassed anywhere else in southern Alberta. The sanctuary is an important wintering site for numerous waterfowl and the Bald Eagle.

Site B6 - Inglewood Bird Sanctuary



The area has an interesting history, centering around its settlement by Colonel James Walker and its subsequent history as a sanctuary. Aesthetically, it is very attractive. The sanctuary is not contiguous to other sites of nature conservation significance.

Constraining Factors: The sanctuary is City-owned although presently only about 2.42 acres (1.0 ha) are designated parkland. The area is reasonably accessible by vehicle as 9 Avenue S.E. terminates here. However, the sanctuary is in an isolated location, on the inside of a river meander, surrounded by C.P.R. yards, an oil refinery, a manufacturer of concrete blocks, a florist and two service garages. A portion of the residential community of Inglewood is located to the north of the oil refinery and south of 17 Avenue S.E. The sanctuary receives moderate levels of use. Oil seepages from the adjacent refinery have occurred but no adverse effect upon fauna or flora has been noted. Monitoring takes place on a regular basis.

Approximately 31% of this site lies within the floodway.

Implications and Opportunities: Presently, the status of this site is uncertain. It exists as a bird sanctuary but, excepting one minor parcel of land, is not designated parkland. The boundaries of the site are also uncertain. Generally, the area of grassland adjacent to the river at the northern end of the site east of 23 Street S.E. and north of 9 Avenue S.E. is not considered part of the sanctuary. However, its formal status as city-owned land is identical to that of the sanctuary. A small portion of these grasslands are owned by the adjacent oil refinery and have been partially disturbed. However, the grasslands have considerable potential for regeneration and contain a number of rare plant species. Kestrels, Goldfinch and Kildeers are often observed in this area. Formal inclusion of this area as part of the sanctuary would allow the regeneration of a high quality grassland community to take place which would provide habitats complementary to those existing in the riverine forest. It would also serve as a buffer zone for the main part of the sanctuary and facilitate greater control of access.

Adjacent to the southwest boundary of the sanctuary is a triangular shaped area of private land with scattered Balsam Poplar growth. It is situated between Sanctuary Road, the oil refinery, the C.P.R. yards and the Bow River. This area has not been inventoried but may have the potential to form a possible future extension of the sanctuary and presently functions as an effective buffer.

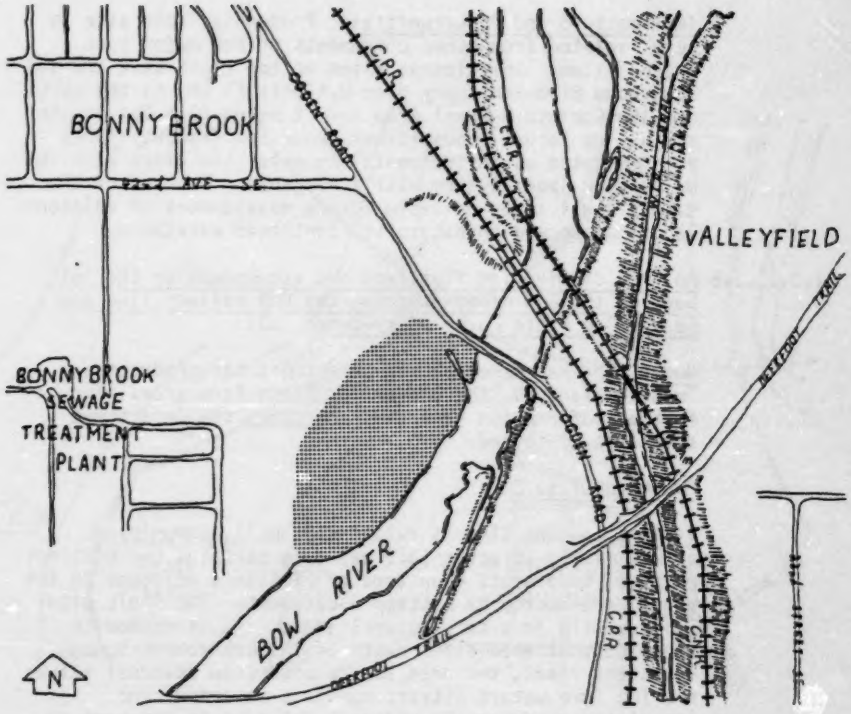
The bicycle pathway adjacent to the lagoon within the sanctuary is an anomaly. It is not well connected with other bicycle routes and is not a desirable use within this type of area which is intrinsically suited to passive and pedestrian uses. The vast majority of the users of this facility are considerate but a minority stray from the trail along other dirt trails, considerably disturbing the wildlife. The frequency of these occurrences can only increase in the future.

B1.3.11.1.7 An area of flatlands on the right bank of the Bow River immediately south of the Bonnybrook Bridges: City-owned (B7)

Proposed Class 3

Rationale: Approximately 15 acres (6 ha) in size, this site is relatively small. It is primarily of significance for the number of species of birds which are found here. There is some disturbance; dumping is a problem adjacent to the site and there is some rudimentary trail

Site B7


BONNYBROOK
COUTTS ROAD
C.P.R.
C.N.R.
VALLEYFIELD
BONNYBROOK SEWAGE TREATMENT PLANT
BOW RIVER
N

development. Although small, the area supports grassland, shrub and riverine forest communities. The aesthetic qualities of the site are emphasized by its location in an area of predominantly industrial development.

The site is not contiguous to other major sites of nature conservation significance. The potential value for use and enjoyment is limited by virtue of its restricted size and location and its lack of natural physical features of particular significance.

Constraining Factors: Industrial use is the most common surrounding land use. The site is located immediately adjacent to a major thoroughfare and sewage treatment plant and is located opposite a site destined for industrial development. The site and the grassland area to the west are City-owned. The grassland area is developable and is an obvious site for expansion should upgrading of the Bonnybrook Sewage Treatment facility take place. Access to the site is good from the Ogden Road but the present level of use is low.

The entire site is located within the floodway.

Implications and Opportunities: Presently, this site is very isolated from other components of the major open space system. The closest sites on the right bank are the Inglewood Bird Sanctuary over 0.6 mile (1 km) to the north and the Cominco Natural Area over 2 miles (3.5 km) to the south. As future subdivisions occur and floodway lands are dedicated as Environmental Reserve, the links with the major open space system will strengthen. Because of the site's small size, possible future development of adjacent lands may pose a threat to its continued existence.

B1.3.11.1.8 An area of riverine flatlands and escarpment on the left bank of the Bow River abutting the CNR railway line and Beaver Dam Flats Park: City-owned (B8)

Note: The Parks/Recreation Department has produced a "master plan" for the Beaver Dam Flats Park area. For further information regarding the plan, the Department should be contacted.

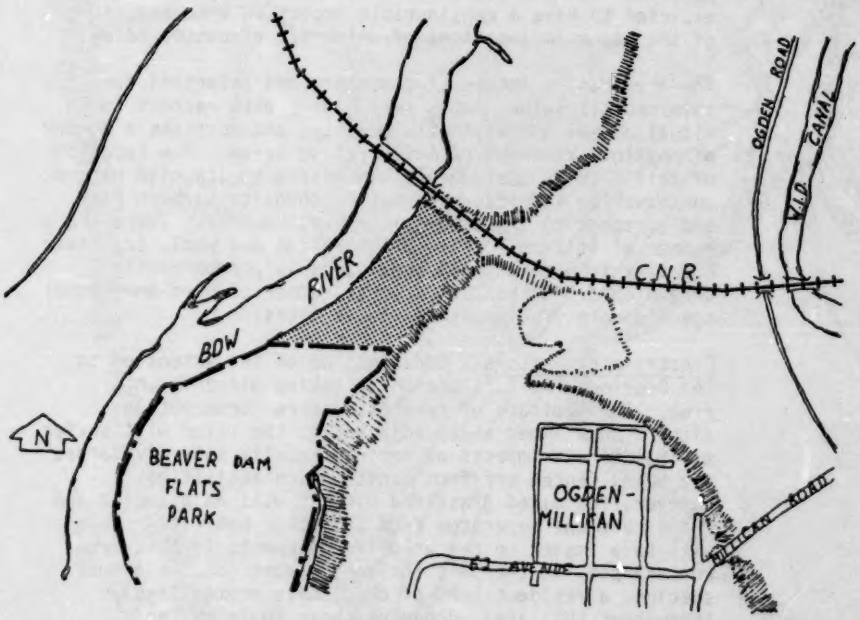
Proposed Class 2

Rationale: The site is relatively small, comprising approximately 16 acres (6.5 ha). It contains two distinct physical components - an area of flatlands adjacent to the Bow River, backed by a steep escarpment. The whole site is presently in a very natural state. As is common to other natural area sites south of the Bonnybrook Sewage Treatment Plant, the area has considerable seasonal value; the ice free waters attract numerous waterfowl and associated predators in winter. The site is adjacent to Beaver Dam Flats Park which contains significant areas of wildlife habitat, particularly adjacent to the river. To the north of the C.N.R. tracks, land within the Bow River floodway is generally in a natural condition. Aesthetically, this site is very attractive.

Constraining Factors: The site is presently undeveloped. It is undevelopable since the escarpment is very steep and approximately 82% of the site lies within the Bow River floodway. There is no direct access to this area which is fenced off from Beaver Dam Flats Park.

Implications and Opportunities: Relatively small natural areas such as this are particularly susceptible to the effects of indiscriminate use. With respect to its physical and vegetational characteristics, this area is an obvious northern extension of Beaver Dam Flats Park. However, its significance as a natural area is notable due partially to the fact that it has, until recently, been in

Site B8


OGDEN ROAD
V.I.D. CANAL
C.N.R.
RIVER
BOW
N
BEAVER DAM
FLATS
PARK
OGDEN-
MILLICAN

private ownership and has and continues to receive little use. Consequently, it is desirable that this site is incoporated into the park and the most appropriate future role can be best evaluated following detailed site study.

B1.3.11.1.9 The Cominco Natural Area (B9)

Proposed Class 1

Rationale: The site is relatively large, presently covering over 200 acres (over 81 ha). When construction of the Deerfoot Trail is completed the area will be reduced to approximately 146 acres (59 ha) lying between Deerfoot Trail and the Bow River south of Heritage Drive. Approximately 9% of this area is under water. The Cominco site is notable for its large area and contiguity with other habitat areas. However, it is of singular importance due to the variety of different communities and habitats it contains. This area of riverine forest is a typical habitat of the Calgary environment and one of the best examples within the city. Similarly, the aquatic habitats are of very high quality.

Portions of this site have been considerably disturbed in the past but disturbance has been mostly localized in extent and regeneration of the natural habitat has occurred over the years. The new Deerfoot Trail can be expected to have a considerable impact on the area, some of the major implications of which are discussed below.

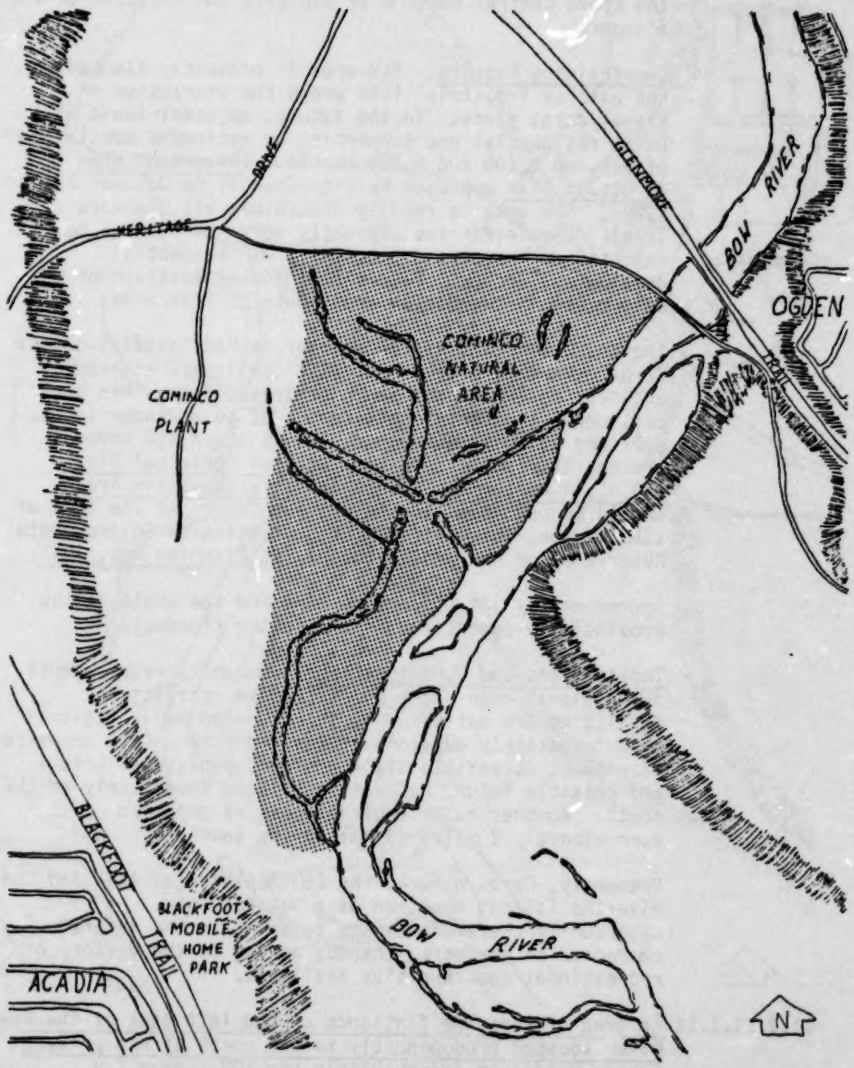
The area has an interesting history and potential for interpretive value, rates very highly with respect to visual appeal and aesthetic quality, and contains a number of physical features of interpretive value. The location of this site is instrumental in adding to its high nature conservation significance. It is opposite Carburn Park and adjacent to the Side Hill riverside area. There are a number of islands located offshore and the whole Bow River corridor from this point southwards is predominantly undeveloped. Currently, a great number of bird and mammal species move freely between these sites.

Constraining Factors: Construction of the extension to the Deerfoot Trail is presently taking place in this area. The habitats of greatest nature conservation significance immediately adjacent to the river will suffer minimal direct impacts as environmentally sensitive areas are being fenced off from construction activities. However, the mixed grassland habitat will be bisected and the escarpment separated from the other habitats. This will have impact on the wildlife movements in this area. For example, in the past the area's most notable animal species, a resident herd of deer, have roamed freely throughout this area, dropping their foals on the escarpment in the spring. In the future, this will not be possible.

The area is accessible via Heritage Drive to the north and a large parcel of vacant City-owned land to the south. It is relatively remote from existing and planned future residential development. The area is in private ownership and trespassing is not tolerated. Consequently, recreational use is minimal. Possible intensive recreational development to the south (refer to Section B1.1.7.1.3) together with development of a more comprehensive trail system adjacent to the Bow River may increase demand for recreational use in the future.

Approximately 54% of the site to the east of the Deerfoot Trail alignment is within the floodway.

Site B9 - Cominco Natural Area



B1.3.11.1.10 Carburn Park: City-owned (B10)

Proposed Class 2

Rationale: Covering an area of approximately 70 acres (28 ha), this area is moderately large. It is aesthetically attractive and contiguous to a naturally wooded escarpment which extends northwards to the Graves Bridge. There are two large natural islands situated in the Bow River adjacent to this site which lies opposite the Cominco Natural Area. The fluvial processes associated with the accretion of the meander along which the park lies are of interpretive interest.

The area has been disturbed in the past. The northern portion of the park has been stripped of natural vegetation and a natural gas right-of-way passes through the treed central portion of the park and the apex of the meander.

Constraining Factors: The area is presently flanked on the east by industrial land where the extraction of gravel takes place. In the future, adjacent lands will be in residential use supporting an estimated population of between 8,200 and 8,800 people. (Riverbend Area Structure Plan approved by City Council on October 23, 1979). The area is readily accessible via Glenmore Trail. Use levels are presently very low but can be expected to increase dramatically as residential development occurs. Future residential development may also occur in the Barlow area south of Riverbend.

The southwest part of the meander is Provincially-owned. Carburn Park is City-owned. The contiguous escarpment adjacent to the lagoon south of Graves Bridge has been considered throughout this report as an addendum to the park and is privately-owned. It is steep and under present City policy (Calgary General Municipal Plan (1979); A Policy for Environmentally Sensitive Areas), should be preserved in its present form. At the time of subdivision, it qualified for dedication as Environmental Reserve under the provisions of The Planning Act, 1977.

Approximately 33% of Carburn Park and the whole of the Provincially-owned land is within the floodway.

Implications and Opportunities: Community requirements for regional open space and intensive recreational facilities are satisfied by the proposed major regional park immediately adjacent to Carburn Park on the opposite riverbank, accessible via a proposed pedestrian bridge, and possible future recreational lakes immediately to the south. Another major regional park is proposed approximately 2 miles (3 km) to the south.

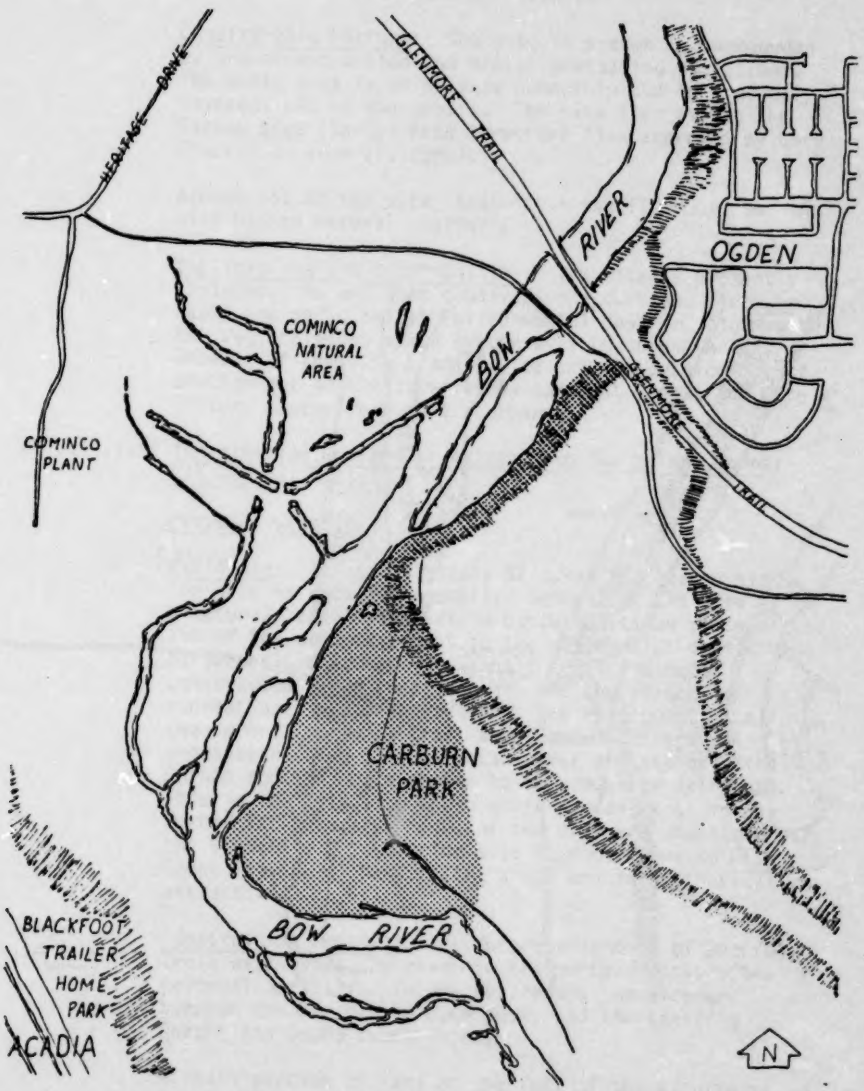
Presently, Carburn Park, the Cominco Natural Area and the riverine islands function as a natural unit. An opportunity therefore exists to maintain the natural character of the park, thereby adding to the variety of recreational opportunities available.

B1.3.11.1.11 An area of riverine flatlands on the left bank of the Bow River located predominantly to the north of the private Conmac Bridge at approximately the 108 Avenue S.W. alignment (B11)

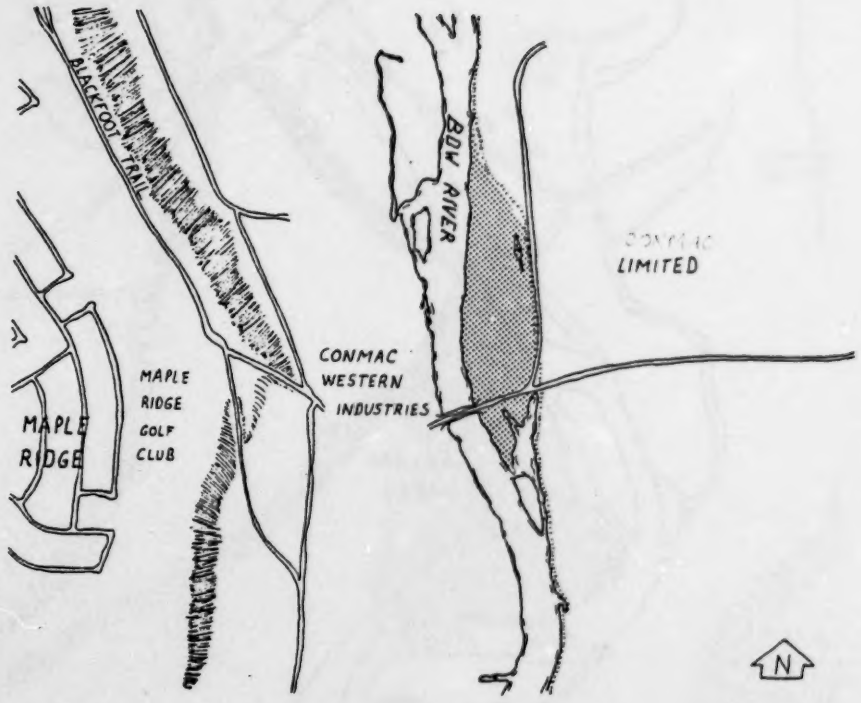
Proposed Class 3

Rationale: The area is small, covering approximately 40 acres (16 ha). While the immediate riverside vegetation is in a very natural condition, much of the remainder of this site exhibits varying amounts of disturbance. An industrial access road passes through the southern portion of this site isolating an area of riverine forest and a small inlet from the major portion of the site. In

Site B10 - Carburn Park



Site B11


BLACKFOOT TRAIL
BOW RIVER
CONMAC
LIMITED
CONMAC
WESTERN
INDUSTRIES
MAPLE
RIDGE
GOLF
CLUB
MAPLE
RIDGE
N

some areas, the understory has been disturbed or cleared. A wide dirt track leads to a private picnic area which is in a very delapidated condition. The area is not contiguous to other sites of nature conservation significance.

There is considerable potential for the regeneration of natural vegetation. The area is aesthetically attractive, although its visual significance is impaired by the presence of the Conmac gravel processing site on the opposite riverbank. The fluvial processes that gave rise to the spit and the offshore island in the southern part of the site, thereby creating the inlet, are of potential interpretive significance.

Constraining Factors: The site is presently surrounded by gravel extraction and gravel processing operations. The whole area is in private ownership and is presently inaccessible to the public. The site lies within the Barlow area (Barlow Area Structure Plan approved by City Council on June 17, 1980).

Almost 75% of the site lies within the floodway, and the site has no natural 'buffer'.

Implications and Opportunities: The site is presently isolated. As and when subdivision occurs and floodway lands are dedicated as Environmental Reserve, links with the regional open space system will be strengthened. Because of the site's small size and the possibility of development on the immediately adjacent lands, the site is very susceptible to disturbance.

B1.3.11.1.12 The riverine escarpment adjacent to Queensland Downs: City-owned (B12)

Proposed Class 3

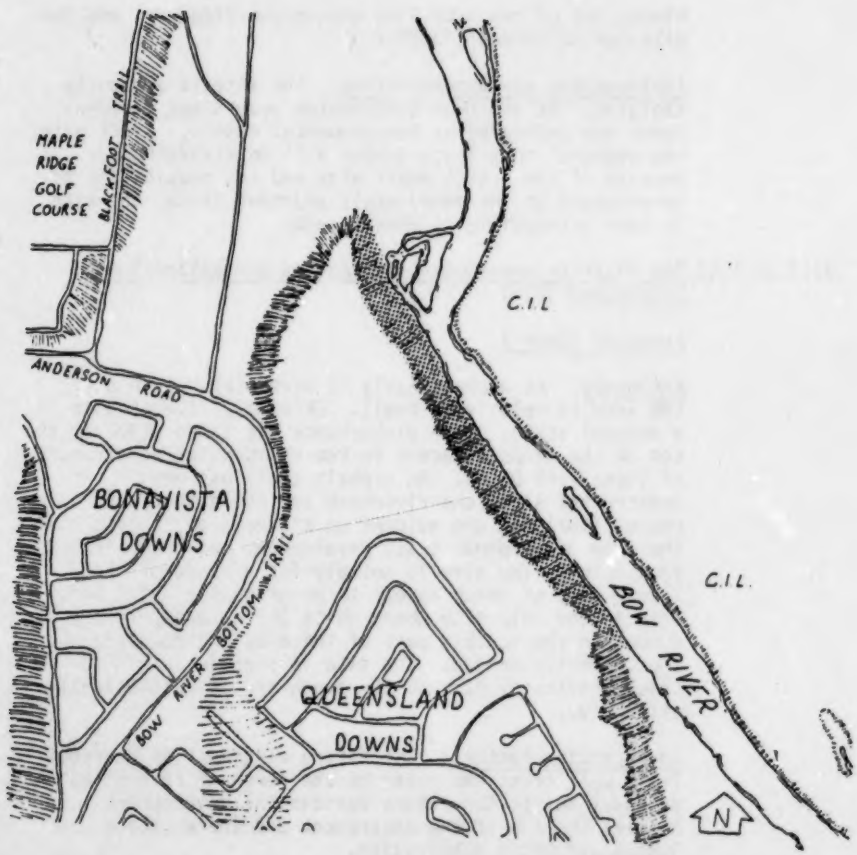
Rationale: At approximately 52 acres (21 ha) in size, the area is relatively small. Generally, the area is in a natural state. Some disturbance has taken place at the top of the slope adjacent to the residential development of Queensland Downs. An asphalt trail has been constructed along the riverbank and the effects of recreational use are evident on the escarpment itself in the form of informal trail development and trampling of vegetation. The site is notable for a stand of White Spruce some of which appear to be gradually dying off. This is the only site where White Spruce exist in any number in the eastern part of the city and downstream of the Crowchild Bridge. The site is contiguous to Fish Creek Provincial Park to the south and is aesthetically attractive.

Constraining Factors: The future alignment of Deerfoot Trail will cross the river to the north of this site. A proposal exists for future residential development between the top of the escarpment and the existing Queensland Downs subdivision.

A small portion of land at the foot of the escarpment (approximately 10% of the site area) lies within the floodway. This area is presently dedicated Environmental Reserve.

Implications and Opportunities: Problems presently exist with the dying off of vegetation at the south end of the escarpment. Public use of this area can be expected to increase.

Site B12 - Queensland Downs Escarpment



B1.3.11.1.13 An extensive area of riverine escarpment including some small areas of riverine flatlands located opposite the Fish Creek Provincial Park: City-owned (B13)

Proposed Class 2

Rationale: The area is large, covering approximately 120 acres (49 ha), excluding the large island adjacent to the shore. There are a few rudimentary dirt trails in the area but the extent of existing disturbance is negligible. The area is in a very natural state. The site is located opposite the existing Fish Creek Provincial Park and adjacent to proposed regional open space facilities to the north and south. It contains a number of natural physical features of interest, notably the extensive slumping on the northern portion of the escarpment which is of potential interpretive significance.

Constraining Factors: The southern part of the escarpment is included with the McKenzie area (Area Structure Plan Approved by City Council on October 23, 1979) where future development of a predominantly residential nature will take place. It is anticipated that future development of a type similar to that presently approved for adjacent developing areas will take place as per the Barlow Area Structure Plan approved by City Council on June 17, 1980. Presently, surrounding lands are in agricultural use. Accessibility is currently poor but this situation can be expected to improve when comprehensive development takes place. Similarly, the site now receives a negligible amount of use but future use potential can be considered to be very high.

The riverine flatlands at the base of the escarpment (comprising 8% of the site area) are located in the floodway.

Implications and Opportunities: The implications of the above factors are twofold. Firstly, numerous Calgarians will be able to enjoy the qualities of this area in the future. At present, its primary function is aesthetic since it provides an attractive and visually dominant backdrop to users of Fish Creek Provincial Park. Secondly, future use, if uncontrolled, will adversely affect the overall value of the area and greatly reduce its nature conservation significance.

Proposed major public regional recreational facilities are located contiguous to the site at its northern and southern extremities (refer to Section B1.1.7.1.5). The escarpment itself is capable of supporting minimal use in its present condition. It is desirable that future recreational use in this area be restricted in order that the area remain natural to complement adjacent intensive uses and provide a greater diversity of recreational experiences for future users. In order to achieve this, it is necessary that appropriate planning and management action be taken early in the design process. Future planning can be expected to deal with the following issues in accordance with recommendations made in Section C1.1.4.11.1 of 'The Plan and Policies'.

B1.3.11.2 The Elbow River

The situation on the Elbow River with respect to natural areas is very different from that existing either on the Bow River or West Nose Creek. At one time, lands adjacent to the river probably supported outstanding natural areas. Low-lying lands along meander bends on similar rivers in the Calgary region (e.g. the Sheep and Highwood Rivers) are superb locations supporting a rich variety of riverine habitats.

Site B13

BOW RIVER
QUEENSLAND DOWNS
CANYON
DEER RIDGE
DEER LANE
DEER RUN
FISH CREEK PROVINCIAL PARK
FISH CREEK PROVINCIAL PARK
PATTERSON FARM
FISH CREEK SEWAGE TREATMENT PLANT
BOW RIVER
CIL
N

During the course of this century, intensive development on the lands adjacent to the Elbow River destroyed the vast majority of pre-existing habitats. Yet numerous species still remain, partly because considerable open space has been retained south of the Glenmore Dam and partly because much development on lands immediately adjacent to the river has been in the form of low density single-family housing (refer to Section B1.3.7.3 iii.).

The vast majority of the remaining natural areas adjacent to the Elbow River are either small and/or fragmented, or are portions of existing intensively used parks (refer to Sections B1.3.12). Accordingly, only one site is identified as a Major Natural Area below. However, because of the particular significance of many of the remaining sites, a special section is devoted to a discussion of these areas and appropriate recommendations are made in Section C1.1.4.12 of 'The Plan and Policies'.

B1.3.11.2.1 Elbow Island Park (E1)

Proposed Class 3

Rationale: The park is very small comprising approximately 6 acres (2.5 ha). This site supports a variety of species and most of the site is in a natural state. Disturbance occurs adjacent to the trails and along certain areas next to the river. The site has considerable intrinsic appeal and is unique as the smallest island park in the city and the largest island in the Elbow River.

Constraining Factors: The park is accessible only to pedestrians via the Mission Bridge. It is surrounded by intensive land uses and is within easy walking distance from the surrounding residential areas. It receives considerable use. The park is situated entirely within the floodway.

Implications and Opportunities: Present levels of use can be expected to remain high as the park fulfills a valuable function in providing access to the river for a large population in an area where access to the river is either physically restricted by roads or non-existent due to private residential development. Fairly high levels of use create some problems with respect to impairment of the natural resource and various forms of disagreeable behavior.

B1.3.11.3 West Nose Creek

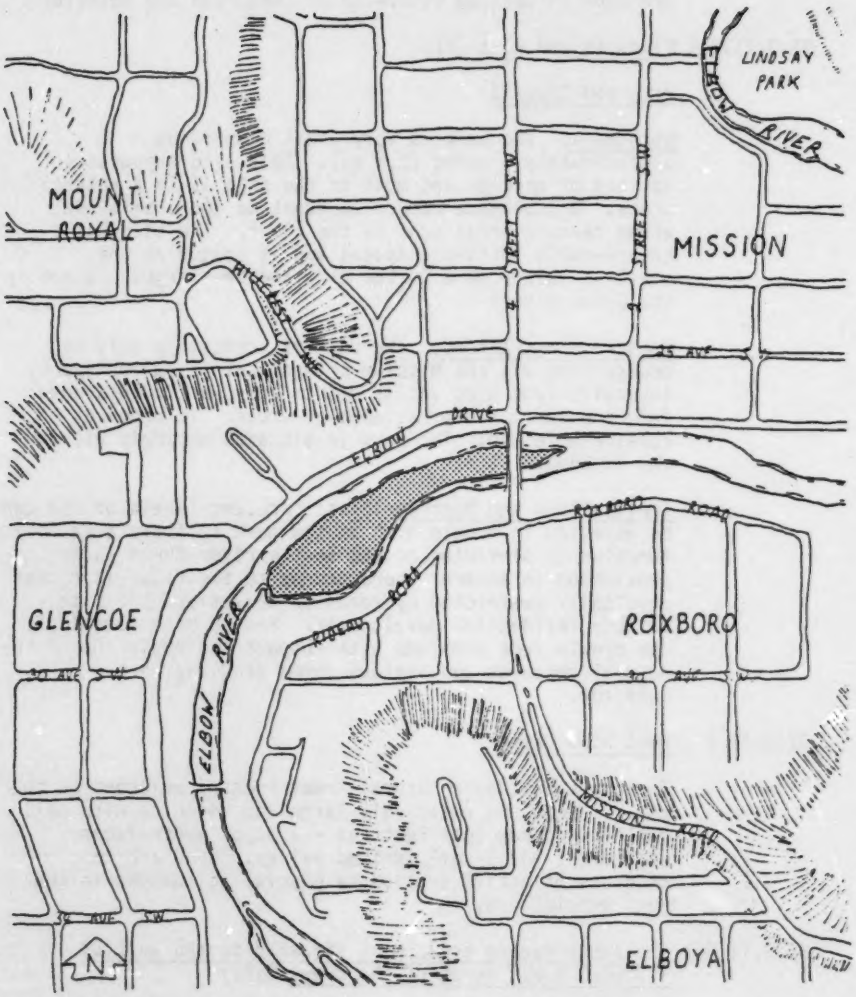
There are two Major Natural Areas located adjacent to the creek. Both are relatively large and coincide with well defined geographical features - a major south-facing escarpment and a well defined valley. Both are the products of active erosion by glacial meltwaters in the post glacial era.

B1.3.11.3.1 The south-facing escarpment situated to the west of 4 Street N.W., north of the creek (WN1)

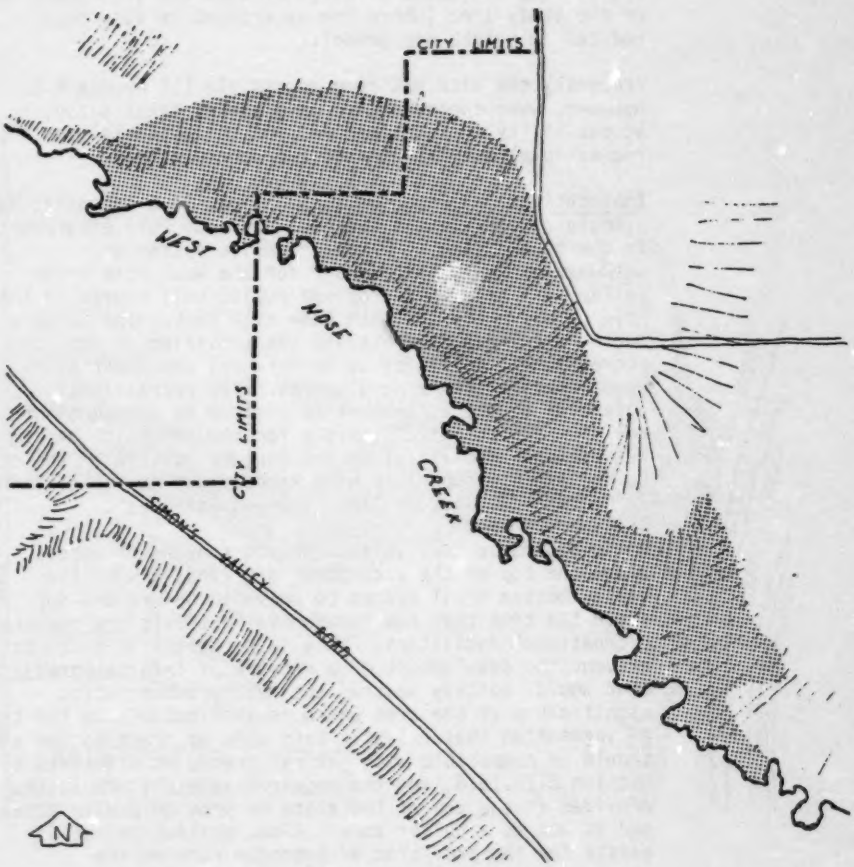
Proposed Class 2

Rationale: The area is large comprising approximately 150 acres (61 ha) and contains a diversity of grasses, flowering plants and associated species, notably various birds. With the exception of portions of Bowmont Park, it is the only Major Natural Area within the city's river/creek valleys where there is a high quality prairie fescue grassland in a natural condition. The only significant source of disturbance is a farm access dirt road which connects with the Beddington-Delacour Rd. (112 Avenue N.W.), and the old '1891 Quarry' which has been recolonized with natural vegetation and is of historical and interpretive interest.

Site E1 - Elbow Island Park



Site WN1


CITY LIMITS
WEST
NOSE
CREEK
CITY LIMITS
SIMONY VALLEY ROAD
N

The open character of the area and the commanding views from the top of the escarpment add aesthetic interest. The escarpment is the dominant and visually outstanding feature of the West Nose Creek valley. The area also possesses interesting physical features in the form of sandstone outcrops on the escarpment and abandoned channel meanders adjacent to the creek at the base of the escarpment. These are of potential geological and geomorphological interpretive significance respectively.

Constraining Factors: This area, surrounded by agricultural land, has recently been annexed to the City of Calgary and is presently in private ownership. The Calgary North Policy Report embraces this area and envisions predominantly residential development in the future which would include the area at the top of the escarpment. The Beddington Trail (Expressway) will be situated facing the escarpment on the opposite side of the creek, north of the present Simons Valley Road. It will connect with the proposed North West Bypass (Stoney Trail), the alignment of which crosses the escarpment west of the study area (where the escarpment is very much reduced in height and grade).

Presently the site has poor access via 112 Avenue N.W. However, when comprehensive development takes place, accessibility will be improved and the potential for recreational use will increase proportionately.

Implications and Opportunities: There is a potential for a regional park to the east and south of this escarpment in the creek valley. A comprehensive system of walkways/pathways is proposed for the West Nose Creek valley to link with a proposed public golf course in the Nose Creek valley and with Nose Hill Park. The Calgary North Policy Report envisions the provision of public recreational facilities as an integral component of comprehensive future development. The recreational potential of the escarpment is limited by virtue of its relief. The potential exists for the provision of recreational facilities on the lowland portion of the site to the extent compatible with Recommendation ii) contained in Section C1.1.4.2 of 'The Plan and Policies'.

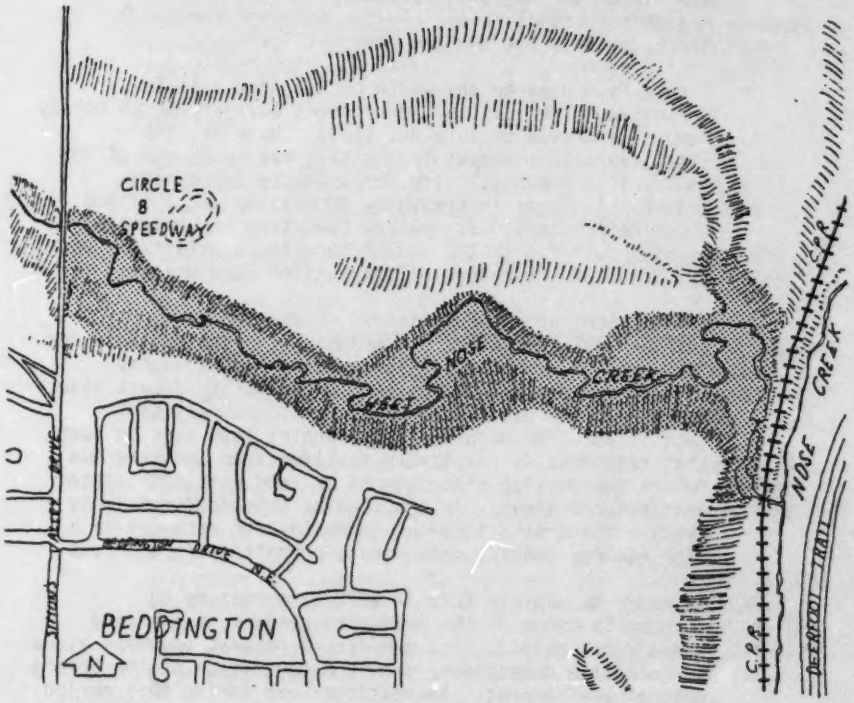
It is desirable that sufficient and convenient access along the top of the escarpment and linking with the valley bottom trail system be provided before and not after the time that new residential subdivisions require recreational facilities. This is necessary in order to prevent the development of a network of informal trails that would quickly destroy the nature conservation significance of the area which is attributable to the type of vegetation that exists. Land uses adjacent to the site should be compatible with natural areas, as discussed in Section B1.3.10.6, and the required setbacks should be provided at the top of the slope to provide public access and to act as a buffer zone. Also, obvious potential exists for the provision of toboggan runs on the escarpment. Such runs are desirable and legitimate means of satisfying the outdoor winter recreational aspirations of future young residents. They should not be allowed to develop informally however, and specific provision for their location should be made on non-sensitive portions of the site.

B1.3.11.3.2 West Nose Creek Valley East of 4 Street N.W. (WN2)

Proposed Class 3

Rationale: The area covers approximately 79 acres (32 ha) and contains some rare flora and fauna of the Calgary region's prairie environment. In the past, the valley was in a very natural state, a condition which has changed in

Site WN2


CIRCLE
8
SPEEDWAY
BEDDINGTON
N
CREEK
NOSE
CREEK
NOSE
CREEK
TRAIL

recent years through neglect and abuse to the extent that this is presently the most disturbed of all the natural areas in the river/creek valleys. Its nature conservation significance is considerably impaired. The main causes of disturbance have been the indiscriminate use of motorized vehicles and dumping, abuses that are by no means uncommon in other natural areas but which have a disproportionate impact here by virtue of their extent and the fragile nature of the environment in this valley.

The area has a number of sites of archaelogical significance and contains the well known 'Split Rock' glacial erratic, a feature of dual archaelogical and geological significance which has considerable interpretive value. The aesthetic qualities of the area have been greatly reduced by the amount of disturbance but the area has considerable potential for recovery.

Constraining Factors: The area has been recently annexed by the City and is presently in private ownership. North of the site, immediately east of 4 Street N.W., is the Circle Eight Speedway. To the east and north of this site, well away from the creek, are two areas of gravel extraction. To the south is the residential subdivision of Beddington Heights and a large disturbed area. The Beddington Trail (Expressway) alignment passes close to the rim of the valley, separating the site from the residential subdivision. To the east are the C.P.R. tracks, Nose Creek and the Deerfoot Trail.

Future land uses to the north of the area will be dominated by residential development (Calgary North Policy Report, approved on July 22, 1980). However, the extensive site immediately abutting the north rim of the valley is a potential site for a future employment centre. The area is presently accessible via 4 Street N.W. and 6 Street N.E. Future long term use potential is considerable but in the medium term it is relatively low by virtue of the nature of surrounding land uses.

Implications and Opportunities: Major regional recreational facilities are proposed in both the Nose and West Nose Creek valleys, along with a comprehensive network of trails. The Calgary North Policy Report also recommends the establishment of public recreational facilities. The nature of surrounding land uses is such that this area is relatively isolated from existing and future residential developments by land uses compatible with natural areas. An opportunity therefore exists to realize the area's inherent potential for recovery to a high quality natural site before permitting further use.

In order to achieve this it will be necessary to thoroughly clean up the area with respect to existing dumped garbage and, by a process of natural recovery aided by intensive management, permit regeneration of the area's natural environment. Recreational use during this period should be restricted to any trails located above the valley. Recreational facilities to the extent permitted under Recommendation ii) in Section C1.1.4.2 of 'The Plan and Policies' can be gradually introduced into the valley and recreational use restricted to those portions of the site which have been ecologically hardened (which should correspond, to the extent feasible, with former areas of considerable physical disturbance where regeneration within a reasonable time frame is not feasible).

B1.3.12 Small, Fragmented, Discontinuous and Less Significant Natural Areas

These areas exhibit great variety, ranging in size from small enclaves in residential back yards to the major Nose Creek escarpments. Individually, many such areas are of minor significance, in no way comparable to any of the varying types of natural areas discussed above with respect to any of the evaluatory criteria (refer to Section C3.7) identified. Others are more significant and collectively such areas play a major role with respect to the overall aesthetic quality of lands adjacent to the watercourses and the variety and number of species present. A small enclave of riverine forest, a slough surrounded by indigenous vegetation and supporting a rich aquatic life (particularly where immediately adjacent to land uses which are often visually offensive) are of immense value in the collage of diverse land uses which define the character and quality of Calgary's riverside lands.

Unfortunately, the very characteristics that make these areas desirable contribute to their extreme susceptibility. Many are in private ownership with an uncertain status, dependent entirely on the whims of individual owners. A property owner who has taken pride in maintaining the natural riverside vegetation may overnight be replaced by one who desires a manicured lawn extending to the waters edge. Thus, slowly, inexorably and effectively the character of our riversides are changing, becoming more homogeneous, standardized and sterile.

The problem is of varying significance dependent on the particular river or creek, the location and the type of ownership. Residential areas abutting the Elbow River exhibit a pleasing diversity in character with the intimate scale of the river. Generally, back yards are manicured but some natural areas remain. The culturally imposed landscape is one of long standing and is aesthetically pleasing. Nevertheless, as more natural areas disappear variety is reduced and along with changes in habitat, changes occur in the numbers and composition of mammal and bird species present and an overall loss of the natural riverine character results.

On the Bow River, the situation is different. The Bow is larger and wilder; manicured lawns present an incongruous appearance. In the past, riverside residents recognized this fact and the vast majority of owners left the riverside area in its natural state. Recently, the situation has changed. Mature trees and undergrowth alike are being cleared at an alarming rate as subdivisions occur. The new, smaller lots lack the space to retain the land which was preserved in the past. Short term economic gain invariably assumes precedence over preservation.

The problem is by no means confined to residential areas:

- Areas in agricultural use immediately adjacent to portions of both the West Nose and Nose Creeks testify to years of abuse and neglect.

- Most industrial riverside users have long been totally insensitive towards the quality of natural vegetation existing on the riverbanks.

- The development of residential subdivisions frequently results in the loss of natural features and natural areas and the provision of minimal open space. Paradoxically, where situated adjacent to public open space lands, 'parkland' and 'nature' are the most commonly emphasized selling points.

- Publicly owned natural areas are frequently abused and shabby; an understory of broken bottles and other miscellaneous discarded litter amongst damaged and broken trees and shrubs is a common sight. Recommendations concerning this problem are made in Section B1.13 of 'The Plan and Policies'.

Portions of many existing riverside parks remain in a natural or near natural state as indicated in the Environment Inventories. Such areas provide the public with a different type of recreational experience and are highly valued by those who use them. These areas are of particular importance where they abut Major Natural Areas and act as 'transitional zones' - the western extremity of Bowness Park and both the eastern and western portions of Edworthy Park are good examples. Unfortunately, littering is a problem of considerable dimensions in many such areas with the result that some have a decidedly 'shabby' appearance. Recommendations concerning regular clean-ups of all public open space areas are made in Section C3.1 of 'The Plan and Policies'.

It is recognized that as use pressures on existing parks continue to rise, expansion of the manicured portions of parks into more natural portions may become necessary locally. However, this is not desirable since it reduces the qualitative variety of recreational experiences which many parks presently provide.

B1.3.12.1 Natural Areas Adjacent to the Elbow River

B1.3.12.1.1 Overview:

There are numerous natural areas in the vicinity of the Elbow River. For the most part, they are either small, isolated or fragmented or are of limited natural conservation significance. These areas include Scotsman's Hill, the riverside area of Lindsay Park, the escarpment adjacent to the communities of Rideau/Roxboro, portions of Stanley Park and much of the riverbank along the entire length of the river. These are important local resource features. They make a major contribution to the aesthetics and character of lands in the vicinity of the Elbow River and they support a variety of species. It is desirable that they be preserved (refer to Section C1.1.4.12 of 'The Plan and Policies').

B1.3.12.1.2 Discussion: Natural areas in open space lands downstream of the Glenmore Dam require special consideration. These extend to approximately the end of Riverdale Avenue and include the escarpment between the communities of Elboya and Elbow Park which extends towards Elbow Drive. Like other natural areas in the Elbow River area, they are relatively small and fragmented. Unlike other such areas, the intervening lands are in open space use and are not developed. Largely, in consequence, these lands are of the greatest nature conservation significance of all lands in the vicinity of the Elbow River in the study area. By means of comparison with the evaluatory rankings afforded to Major Natural Areas, these areas, taken together, merit a ranking of 2.

The majority of sites abut the Elbow River. Together they cover a significant percentage of the open space lands north of the Glenmore Dam. They contain a considerable variety of natural communities, species and habitats. Natural and Recreational Features of Sandy Beach, a Calgary Field Naturalists' Society document (March 1976) noted that riverine forest, aspen forest, coniferous

forest, grassland, and aquatic communities can be found in this area. Over 100 species of birds were identified together with over 170 non-cultivated vascular plants. According to one Society member, 259 species of non-cultivated vascular plants have been identified. The area is frequented on a seasonal basis by a number of species including the American Dipper which can be observed in winter below the Glenmore Dam which is often ice free.

Portions of the natural area sites are disturbed. Intervening parkland receives intensive recreational use and the effects of vegetation trampling are evident in many locations. All the smaller plants are susceptible to trampling and, increasingly, a number of identified rare plant species are becoming more difficult to find. Considerable potential still exists for the regeneration of natural vegetation on many of the disturbed sites, but because of heavy use, stringent management measures would probably be required.

The area has a relatively long history of settlement and contains a number of archaelogical sites. It also contains a number of distinct physical morphological units and a number of physical features of potential interpretive value, notably the sandstone outcrops of the Porcupine Hills formation on escarpments adjacent to river. With the exception of Glenmore Athletic Park and the reservoir, surrounding lands are entirely in residential use.

The most important individual natural area sites are briefly described below:

(i) The escarpment on the right bank of the Elbow River, immediately below Glenmore Dam.

The site consists of an area of mixed conifers flanked on either side by steep, unstable slopes which are largely devoid of vegetation. The escarpment is visually dominant and has potential interpretive value. Much of this site lies adjacent to a new residential subdivision in Mayfair/Bel-Aire. It has been dedicated as Environmental Reserve and there is a 60 foot (18 m) setback from the top of the escarpment. The remainder of the site is privately-owned by the Calgary Golf and Country Club. The site is accessible from the Glenmore Dam Bridge Road and from the new residential subdivision. Presently, the area receives little use. Surrounding land uses are city-owned vacant space, single-family residences and the Calgary Golf and Country Club. These are of a compatible and complementary nature. Present low intensities of use can be expected to continue. Access along the slopes of the escarpment is difficult, and undesirable by virtue of the steepness and instability of the slope.

(ii) The escarpment on the right bank of the Elbow River extending from approximately the 54 Avenue S.W. alignment to the 47 Avenue S.W. alignment.

The escarpment is covered predominantly by mixed conifers. Approximately downstream of the 50 Avenue S.W. alignment, it becomes very steep and practically devoid of vegetation. The majority of this site is privately-owned by the Calgary Golf and Country Club. The downstream publicly owned portion

of the site is accessible from 50 Avenue S.W. and Britannia Drive. Present low intensities of use can be expected to continue. The steepness of the publicly owned portion of the site effectively prohibits use whilst the more physically accessible portion of the site is in private ownership. The adjacent golf course is a complementary use. General access to the escarpment is undesirable since the area can withstand very limited use.

(iii) An area adjacent to the left bank of the Elbow River located downstream of the Glenmore Dam and including an area of riverine forest and a steep escarpment.

This area contains two distinct types of habitat, an area of riverine forest and a very steep, sparsely vegetated south-facing escarpment. There are a number of informal trails in the area of riverine forest. Some of the undergrowth is damaged and littering is a problem. However, the area is in a fairly natural state. Adjacent areas are seriously disturbed, primarily by the indiscriminate use of all-terrain vehicles and dumping. The escarpment has potential interpretive value and is contiguous with the recently acquired Boothman properties which contain some natural areas of significance. Aesthetically, the site is pleasing. The opposite riverbank is particularly attractive and there are good views to the south across the Calgary Golf and Country Club from the top-of-the escarpment. From the riverbank edge at the western end of the site the Glenmore Dam is visually dominant.

The entire site is City-owned, consisting of municipal reserve and lands reserved for the Waterworks Division. Adjacent land uses include a car park, the Glenmore Filtration Plant and Glenmore Athletic Park. Present levels of use are fairly high as the site is readily accessible from Glenmore Athletic Park, 50 Avenue S.W. and the Glenmore Dam Bridge Road.

Relatively high levels of use can be expected to continue. Since the area is readily accessible yet constitutes a 'dead end' in the sense that it is located at the base of the dam with no continuing access to the west, problems of rowdiness and vandalism do exist. The generally unattractive appearance of the surrounding lands and the presence of considerably disturbed areas immediately adjacent to the site do impair its aesthetic value. An opportunity exists to thoroughly clean up adjacent lands and improve trails within the site.

(iv) Natural areas within River Park, Sandy Beach and Riverdale Park.

All three parks receive intensive recreational use yet contain significant areas of natural habitat, some of which have been extensively disturbed. Most of the natural areas are fairly small in spatial extent and are not clearly defined. The most notable sites are lands abutting the river throughout Sandy Beach and River Park, lands adjacent to the river in Riverdale Park between the Sandy Beach pedestrian bridge and Riverdale Avenue, the escarpment separating the communities of Elboya and

Elbow Park and some areas of grassland in River Park adjacent to 14 Street S.W. Together they are of considerable significance, providing habitats for a number of species, adding interest and beauty to their respective parks and providing a greater diversity of recreational experiences for the people using the parks.

Due to their relative lack of contiguity, their small size and the considerable use that they receive, their continued existence as 'natural areas' is threatened. Significant impairment has occurred particularly in Riverdale Park. Informal trail development, vegetation trampling and vandalism are the main hazards adversely affecting their continued viability.

B1.3.13 Islands

As indicated in the Environmental Inventories, the undeveloped islands in the Bow and Elbow Rivers are the only areas of the riverine environment that are consistently natural. The river forms a natural barrier to man during most of the year and the islands receive only occasional use from boaters and from children who wade across to the islands close to the shore and who cross the ice in winter. The islands are of great visual aesthetic significance and presently support a diverse variety of vegetation, birds and mammals - some on an occasional basis. Also, they are of particular importance as nesting sites for waterfowl.

In the past, the islands have been susceptible to exploitation. Archer's Island was largely excavated for use as fill in the construction of the Crowchild Trail/Memorial Drive interchange. The city's major islands, all of which are situated in the Bow River, are presently developed as parks. An opportunity therefore exists to formalize the status of the remaining islands in order to ensure that, wherever feasible, they remain in their present natural state.

B2 FLOODPLAIN MANAGEMENT

B2.1 HISTORICAL BACKGROUND AND REVIEW OF CURRENT POLICY

B2.1.1 OBJECTIVE

To minimize loss of life, threat to health and to reduce economic loss by flooding.

B2.1.2 BACKGROUND INFORMATION

Bearspaw Dam was constructed on the Bow River in 1954. This facility is primarily utilized for generating electricity and for controlling only short term flow fluctuations in the Bow River. It should be noted that Bearspaw Dam has no potential for controlling major

floods. According to the Montreal Engineering report, "City of Calgary Flood Study, Volume 1, Bow River Report" of May 1973, significant summer flooding in Calgary will occur when flows in the Bow River (above its confluence with the Elbow River) are of the order of 20,000 to 25,000 cubic feet per second (c.f.s.).

With the construction of Glenmore Dam on the Elbow River in 1932, the 1% probability flood of 28,000 c.f.s. has been reduced to 20,300 c.f.s. (refer to "Elbow River Flood Study," Monenco Consultants Limited, (December 1979).

The potential for flooding is greatest during the June-July period when snow-melt is at its peak and severe summer storms are most likely to occur. Winter flooding is caused by ice jams and is a prime concern of the City of Calgary. During the winter of 1945-46, inundation of considerable magnitude occurred in the city, specifically in the Bowness, Hillhurst and Sunnyside areas. Subsequently, the risk of winter inundation has been reduced mainly due to the construction of Bearspaw Dam in 1954, reduction in the monthly winter flows in the river due to lesser reliance on the hydro-electric plants on the Bow River above Calgary for power, dykes through the central districts of the city which prevent surface overflow, and construction of the Ice Pack Anchorage in 1959 downstream of the Louise Bridge. The Montreal Engineering report (1973), states that the effectiveness of the Ice Pack Anchorage has decreased since its inception due to partial infilling by gravel carried along by the river. Although the above described works have reduced the likelihood of a severe winter flood, a potential hazard remains as illustrated by the winter flood of 1966 when the dykes protecting Hillhurst/Sunnyside were topped by floodwaters.

B2.1.3 HISTORICAL SYNOPSIS OF FLOODS

During the period 1879-1902, the City of Calgary experienced three major floods which were greater than any since experienced. A flood of the magnitude of the 1897 flood on the Bow River with a peak flow of 80,000 c.f.s. above the Elbow River, with an estimated return period of once in 70 years, would have resulted in some 2,500 dwellings and 350 commercial and industrial establishments being directly affected by overland flows in 1973. Since that time there has been further development in the floodplain. Additionally, according to the Montreal Engineering report (1973), there is a possibility of peak flood flows substantially greater than those experienced to date.

The years in which Calgary experienced maximum instantaneous discharge on the Bow River in excess of 15,000 c.f.s. are shown in Table 1 below. Table 2 indicates the years in which maximum daily discharge exceeded 5,000 c.f.s. on the Elbow River.

As the city has grown, the danger of serious flood damage to life and property has increased whilst the magnitude of a flood necessary to inflict such damage has dropped. An example of just a small flood will serve to illustrate this point. Referring to June 18, 1933, the Montreal Engineering report "Floodplain of Bow River in the City of Calgary, Volume 1" (February 1968, page A-6) notes that "a minor flood of about 23,000 c.f.s. on the Bow passed through the city without incident". Today, a flood of this magnitude would cause damage to certain buildings

erected in the floodplain because compliance with the current floodplain management policy guidelines is not required in all instances.

In the event of major floods of proportionate severity occurring on both the Bow and Elbow Rivers, potential flood damage would be relatively greater on the Elbow River. In the last 25 years, maximum instantaneous discharge on the Bow River has barely exceeded 17,000 c.f.s. In the 25 year period previous to that, the 20,000 c.f.s. level was exceeded on six occasions. Thus, available evidence clearly indicates that Calgary lives under the threat of a major flood.

Table 1 Bow River - Years in Which Maximum Instantaneous Discharge (M.I.D.) Exceeded 15,000 c.f.s.

1897*, 1902*, 1908, 1909, 1911, 1912, 1915, 1916, 1914, 1920, 1923, 1927, 1928, 1929, 1932*, 1933, 1934, 1936, 1938, 1947, 1948, 1950, 1952, 1953, 1963, 1965, 1967, 1969, 1972, 1974

Source: Alberta Department of the Environment

NOTE: Record dates from 1897 but is discontinuous until the early 1920's.

c.f.s. were recorded.

For the years underlined twice, discharges in excess of 35,000 c.f.s. were recorded.

For the years asterixed, discharges in excess of 50,000 c.f.s. were recorded.

Table 2 Elbow River - Years in Which Maximum Daily Discharge (M.D.D.) Exceeded 5,000 c.f.s.

1908, 1915, 1916, 1917, 1923, 1929, 1932, 1948, 1950, 1967

Source: Alberta Department of the Environment

NOTE: Record dates from 1908. Maximum Instantaneous Discharge was not recorded until the 1975.

For the years underlined, discharges in excess of 11,000 c.f.s. were recorded.

Approximately 28 miles (44.8 km) of the Bow River are contained within the present city limits. The river is swiftly running with an average slope of 9.3 feet per mile (1.72 m/km) and an average flow of 3.2 cubic feet per second. According to the Montreal Engineering report (May 1973), there are approximately 3,693 acres (1495.67 ha) of land in the floodplain and about 1,585 acres (641.93 ha) of land in the floodway areas of the Bow River.

Of the total of 5,278 acres (2137.59 ha), about 22 percent is intensively developed whilst the rest is in open space use. According to Montreal Engineering, control of summer flooding in the Bow River by the construction of large scale engineering works is uneconomical (in terms of potential damages avoided) and, in certain cases, may be socially untenable.

Based on 1973 values, Montreal Engineering estimated that damage from a flood of 80,000 c.f.s. would be about $10 million. These estimates were based on the assumption of idealized flow conditions; the possible blockage of bridges or failure of stream banks were not considered.

Taking into account new development and the inflation factor, the damage estimate for 1980 would not be less than $50 million.

According to the Monenco Consultants report, "Elbow River Flood Study" (December 1979), total potential damages from a flood of 20,300 c.f.s. were estimated at $13,470,000.00.

In view of the foregoing, the need to effectively manage future development in flood prone areas of the city is well justified.

B2.1.4 REVIEW OF CURRENT FLOODPLAIN MANAGEMENT POLICY

City Council adopted its present policy guidelines for development in the floodplain of the Bow River on June 24, 1974 (Appendix II). This policy evolved out of the following reports:

1. "Bowness Flood Study Report 1971" prepared by the Montreal Engineering Co. Ltd.

2. "City of Calgary Flood Study, Volume 1, Bow River Report", May 1973, prepared by Montreal Engineering Co. Ltd.

3. "Report" dated January 1974, prepared by the Calgary Bow River Study Committee.

The Calgary Bow River Study Committee was comprised of representatives from the Province of Alberta (Department of the Environment), the City of Calgary and the Faculty of Environmental Design from the University of Calgary. This Committee considered both engineering and environmental concerns, and its recommendations regarding floodplain management submitted to City Council in March, 1974 were as follows:

1. "The floodplain management program proposed by Montreal Engineering Company not be enacted.

2. The City of Calgary's proposed new Zoning By-law not incorporate the floodplain management guidelines."

In dealing with the above recommendations City Council also considered the recommendations presented by the Civic Administration. These recommendations, which are quoted below, were adopted in June 1974 as policy guidelines for development in the floodplain of the Bow River.

Floodplain Management Policy

"a. That flood plain management guidelines be provided to all developers proposing construction within the flood plain as an advisory measure.

b. That flood plain management guidelines be written into the Zoning By-law so that they are mandatory in the following instances:

i) in the case of undeveloped property;
ii) in the case of large developments involving an area of one City Block, or greater;
iii) in the case of spot development which is located in a block where the majority of property owners have already recognized the flood plain management guidelines in their developments."

Notwithstanding the fact that the proposed Zoning By-law No. 8900 discussed by City Council on September 16, 1974 was not approved and since there has been no specific policy for controlling development in the floodplain of the Elbow River, the policy guidelines related to the Bow River have also been applied to development taking place in the floodplain of the Elbow River.

According to the present policy, all developers proposing construction within the floodplain areas of the rivers are provided with development guidelines. These guidelines are mandatory in the case of undeveloped lands and large developments involving an area of one city block or greater, or where the majority of development in a block has already complied, but are advisory in other cases. So far, there have been no major difficulties in applying these guidelines. However, the policy as it stands is not adequately clear and, therefore, all development occurring in the floodplain is not necessarily subject to the current policy.

For example, according to policy "b.i)" above, construction on undeveloped properties shall be subject to the floodplain management policy guidelines, and yet under policy "b.iii)" development is, in fact, permitted without any restrictions since there is no prior "majority" of property owners who have complied with these guidelines.

As a result of the present procedures, large numbers of vacant sites existing in the floodplain can, therefore, be developed without having to comply with the current policy. Clearly, an inconsistency exists between "b.i)" and "b.iii)" of the current policy.

In view of the foregoing, it appears that a well-defined policy is required in order to manage future development in the floodplain within the city limits. Any policies which would place restrictions on the structural aspect of buildings in the floodplain may be challenged as being economically unjustified but the possibility of increased cost should be weighed against the potential hazard of property damage or the threat to life. Therefore, it is vital that floodplain management policies be continued and be more specific, and firm and practical in application. Section B2.1.6 outlines the advantages and disadvantages of various alternatives for reducing flood damages which form the basis for the policies included in Section C1.2 of 'The Plan and Policies' part of this study.

B2.1.5 GENERAL DISCUSSION

The spring of 1979 saw the usual occurrence of flooding in many parts of Canada and the U.S.A. It was a bad, but not particularly unusual year. Examples of a few headlines from the Calgary Herald in the latter part of April indicate the extent of the problem and the exposure it received: "Prairie Towns Bracing Against Floods"; "Manitoba Flood Situation Serious: 10,000 Ordered Evacuated"; "Prairie Residents Continue the Battle Against Floods"; "Floods Leave 17,000 Homeless"; "Floods Put N.B. in State of Emergency"; "... flood-weary States"; "Flooding Hits Alberta as Ice Jams Break Up".

In Canada, flooding was most serious on the Red River in Manitoba. Winnipeg escaped by virtue of the existence of a "floodway", in this case an artificial overflow trench that ringed the city. The level of flooding was comparable to the devastating flood of 1950 and 10,000 people were ordered evacuated. Other provinces affected were New Brunswick where the Saint John River flooded Fredericton, Saskatchewan where the Souris River affected Estevan, and Ontario where flooding occurred on the Mississauga and Blind Rivers in the vicinity of Sault Ste. Marie and the Sturgeon River near North Bay. In

Alberta, ice jams on the Athabasca River resulted in floods in Fort McMurray which necessitated the pumping of raw sewage into the Clearwater and Hangingstone Rivers by the town's sewage plant. Emergency measures were taken in many of the above cases.

In the United States, flooding of varying degrees of severity affected parts of North Dakota, Mississippi, Alabama, Louisiana, Minnesota, and Texas. The most serious flooding occurred on two rivers:

i) The Red River: The U.S. Air Force, in an attempt to stem flooding flew in over one million sandbags to North Dakota and almost a million sandbags to the town of Grand Forks, Minnesota. The cost of flood damage to North Dakota was an estimated $66 million.

ii) The Pearl River: Flood damage to Jackson, Mississippi was estimated at $500 million with over 17,000 people left homeless.

In some areas of the world, notably adjacent to watercourses that are subject to annual inundation, the occurrence of natural hazards is an accepted part of everyday life. In areas subject to infrequent cataclysmic natural hazards at irregular intervals, recognition of the likelihood of a future disaster is muted. Whilst such perceptual phenomena are well documented and largely predictable amongst human populations, it can be of great utility to be aware of the possible consequences of non-action. The following is provided as an additional example which may be germaine to the City of Calgary.

On the night of June 9 and 10, 1972, Rapid City, South Dakota experienced a flood. The city is located adjacent to Rapid Creek which rises in the Black Hills. In the post Second World War years there was an encroachment of considerable urban development into the floodplain including motor home courts, residential subdivisions, industrial sites and a nursing home. When the flood occurred, 1,500 homes and 200 businesses were affected. At one time there were 1,500 people on the missing list; 239 people perished and 4 bodies were never recovered. A week later the creek flooded again and two more people died.

Subsequently with massive aid raised partially by the City and largely by the Federal Government, all development was removed from the floodplain (an area about 4 blocks wide on either side of the creek and 5 miles/8 km long throughout the city) for the creation of open space. 1,100 homes were relocated and 157 commercial and industrial establishments were repurchased and relocated. The project was 95% completed within 4 years. One year before the flood the tax base of the city was $109 million; three years after the flood it was $160 million. The city was experiencing greater stability and increased growth, a phenomenon that has occurred wherever such relocation has taken place in the United States. Adjacent to the watercourse Rapid City now has a championship golf course, hiking and biking trails throughout the city, football, soccer, hockey and baseball fields, skating rinks, new parks, an area for motorbike scrambling, horse trails, expanded parking and 'wilderness' type parks in the centre of the city.

The following is a cross-section of comments made on a variety of topics by the then Mayor of Rapid City, Mr. Barnett, at a seminar organized by the Ontario Ministry of the Environment in 1977:

Re: Urban Development in the Floodplain

- "the tragic cycle of land use in the urban floodplain".
- "the horrible example of how not to manage a floodplain in an urban area".
- "violation of the floodplain in a horrible and suicidal manner".

Re: The Night of the Flood

- "a gruesome and agonizing period of death and terror".

Re: Lessons Learnt from the Flood

- "We reached the conclusion that the floodplain was a pretty stupid place to sleep and a stupid place to work. We also reached the decision that the floodplain was a fantastic opportunity to improve the quality of life with the outdoor recreational experience".

Re: The Cost of Relocating Existing Development from the Floodplain

- "the oldest, cheapest and most fallacious bugaboo of all (is that) if you clear the floodplain you destroy the tax base ... political hogwash".

Re: Public Perception of Flooding Hazard

- "You can say it can't happen to you, well I say it can happen to you".

B2.1.6 ALTERNATIVES FOR REDUCING FLOOD DAMAGES

B2.1.6.1 Land Use Planning:

In accordance with Sections 62 and 63 of The Planning Act, 1977, land use plans can be implemented by means of Area Structure Plans and Area Redevelopment Plans respectively; land use and development controls can be implemented in accordance with Sections 95 and 107 of The Planning Act, 1977 and the City's Land Use By-law.

Advantages:

- Risk of large scale damage can be reduced by preventing high risk developments in flood prone areas.
- This type of program will not require large capital investments.

Disadvantages:

- Amendments to such plans can quickly reduce the effectiveness of original plans and policies.

B2.1.6.2 Floodplain Management:

Involves land use planning, flood proofing, construction methods, filling, and raising new structures.

Advantages:

- Large scale damages are prevented.
- Large scale capital investments are not required.
- Place major burden of protection on those who benefit.
- Can permit certain increase in the degree of development allowed in the floodplain.

Disadvantages:

- Floodplain regulations require accurate flood limit mapping.
- If uniformly applied, some areas may become relatively less attractive for development (e.g. downtown or other areas where comprehensive development is proposed).
- Economically feasible only when flooding is to a shallow depth with low velocity.
- Would require the development and administration of detailed regulations.
- In the event of a major flood, there is no guarantee that structural flood proofing measures will be effective.

B2.1.6.3 Construction of Dams and Storage Reservoirs:

Advantages:

- Such measures provide protection mainly to existing developments.
- Permits development where risk would otherwise be prohibitive.

Disadvantages:

- All the taxpayers bear the costs while floodplain users (residents and/or land owners) enjoy the major benefits.
- In the case of the Bow River, it would be very expensive and justifiable only in areas of high value developments and the presence of suitable reservoir sites.
- Storage reservoirs often inundate considerable amounts of land.
- Can create ecological problems e.g. lower water quality.
- Can create a false sense of security.

B2.1.6.4 Construction of Dykes, Retaining Walls.

Advantages:

- Such measures provide localized protection.

- Can be constructed at relatively low initial cost.
- Useful measure against frequent but relatively minor flooding.

Disadvantages:
- Would require use of valuable land.
- Such works can hold water back and cause increased upstream damage.
- These types of structures will reduce the natural capacity of valleys to store flood water. Downstream flooding may also be increased.
- High maintenance costs.
- Substantial damages can occur when structures are overtopped.

B2.1.6.5 Channel Improvements (E.g. dredging, Straightening):

Advantages:
- These measures provide localized protection.
- Such measures help to improve the capacity of the channel to pass floodwaters.
- Minimal land requirements and the effects of these types of engineering works are localized.

Disadvantages:
- Such engineering works may create relatively high velocities and more erosion at low flows and result in deposition of sediments downstream.
- Relocation of major utilities could be expensive.
- These measures can be unsightly and have a severe impact on the existing natural environment.

B2.1.6.6 Flood Forecasting and Warning Systems:

Advantages:
- Flood forecasting systems can reduce threat to life and would allow some protection of portable properties.

Disadvantages:
- Does not reduce flood damage to permanent structures.

B2.1.6.7 Treatment of Watershed: (Tree plantings, preventing ice jams, preservation of natural flood storage area, e.g. swamps)

Advantages:
- Such types of measures reduce erosion and sedimentation and maintain the capacity of the stream to carry flood flows.

- Could reduce downstream hazards by reducing floodwater due to run-off and by reducing debris carried by floodwaters.

Disadvantages:

- Land owners pay costs while everyone benefits.
- Effectiveness of such measures is limited particularly in the case of small watersheds.
- Complex process due to the physical nature of and existing development in the watershed.

B2.1.7 ALTERNATIVES FOR REDUCING FINANCIAL LOSSES RESULTING FROM FLOOD DAMAGES

B2.1.7.1 Public Flood Relief Funds:

Advantages:

- Financial burden on affected individuals is reduced.

Disadvantages:

- Such funds/costs are mainly paid by all taxpayers to the benefit of users (residents and/or land owners) of the floodplain.
- Affected individuals do not care to adapt to flood hazards as long as public relief funds are available to them.

B2.1.7.2 Flood Insurance Scheme:

Advantages:

- Individuals affected are aware of the risk of being in flood prone areas.
- Such financial compensation be could utilized when protective engineering works are not feasible and also during a transition period when old land uses are phased out.

Disadvantages:

- It is doubtful whether any private company will underwrite such policies.
- Insurance premiums would most likely be very high and most floodplain users (residents and/or land owners) would not voluntarily acquire insurance schemes without financial assistance from government(s).
- May be difficult to establish the risk for specific properties.

B2.1.8 The foregoing alternatives for reducing flood damages and financial losses as a result of these damages can be summarized under three headings:

B2.1.8.1 Policy Measures

Potential flood damage can be lessened by land use planning in combination with other suitable regulatory measures such as land use control and building regulations. Such measures either disallow developments

facing high risk, or else specify the precautions that should be taken in the design and construction of buildings in flood prone areas.

Land use planning and floodplain regulations can be implemented through Area Structure Plans, Area Redevelopment Plans and the Land Use By-law under The Planning Act, 1977, and through construction and fill regulations under The Land Surface Conservation and Reclamation Act. When applied, such procedures minimize the need for large capital costs for flood protection measures involving the construction of dams, dykes, and large scale land acquisitions. New subdivisions or single buildings are often constructed on fill raised above the design flood level. This method is used most extensively for flood-proofing new buildings in Canada. It does not require design modifications and if the design flood level is exceeded the depth of water over the fill will be shallow and of short duration. The major disadvantages of these measures are the time and costs involved in developing and administering them.

B2.1.8.2 Engineering Works

Corrective measures such as dams, reservoirs, dykes, channel improvements and other engineering works can modify the effect of a flood on existing and future developments, but most of these engineering alternatives are exceedingly costly and can only be justified in a restricted number of situations. Too much reliance on engineering flood protection measures can, in fact, result in increased damage. Once a flood control facility is constructed, public perception of the flood hazard disappears whilst the hazard may not. New developments in the floodplain then become very susceptible to serious damage.

B2.1.8.3 Alleviative Measures

Flood damage reduction can also be achieved by forecasting systems and watershed management. These measures are predominantly concerned with ameliorating the effects of flooding and are, therefore, attractive as a minimum amount of inconvenience to existing floodplain users (residents and/or land owners) is involved. However, these measures are particularly contentious due to the complex system of interrelationships existing between such considerations as cost and effectiveness (e.g. flood warning systems cannot effectively reduce flood damages to permanent structures existing in the flood prone areas).

B2.1.9 CONCLUSIONS

B2.1.9.1 This study recommends a floodplain management policy based on land use planning and development controls. This is in accordance with concerns expressed by the Calgary General Municipal Plan (adopted by City Council on March 12, 1979) and made by the Calgary Bow River Study Committee (January 1974), The Planning Act, 1977, and the report of the Standing Committee of City Council on Operations and Development (June 1974).

The great advantages of adopting a predominantly land use approach to floodplain management are its comprehensiveness and flexibility. Once established, susceptible lands are subject to compatible uses which will help to safeguard life and minimize costs to the Province, the City and citizens in the event of a major flood. The basic land use framework can stand by itself as a viable approach to floodplain management. If desired, additional measures can be added without detracting from its utility and effectiveness. As it is complimentary to all other alternatives, it would not be rendered obsolete by the adoption of other alternatives.

B2.1.9.2 Development in the Floodway and Floodplain:

B2.1.9.2.1 The main purpose of establishing a policy concerning development in flood prone areas in the city is to minimize the potential for loss of life and flood damages to future developments. Also, in view of escalating land values and their effect on housing prices, the value of development opportunities in the floodplain has been taken into consideration while determining policies for development in the floodway and floodplain areas.

B2.1.9.2.2 The floodway and floodplain limits referred to herein are those included in the "City of Calgary Flood Study, Volume 1: Bow River Report", May 1973, which was prepared by Montreal Engineering Co. Ltd. for the Alberta Department of the Environment and the City of Calgary. In the case of the Elbow River, these limits were delineated by Monenco Consultants Ltd. ("Elbow River Flood Study", December 1979). The terms are defined as follows:

(a) Floodway:

The present channel plus those portions of land needed to convey a designated flood of 80,000 cubic feet per second for the Bow River upstream of the confluence with the Elbow River and 110,000 cubic feet per second (with a probability of occurrence of 1 in 70 years) downstream of the confluence; and 20,300 cubic feet per second (with a probability of occurrence of 1 in 100 years) for the Elbow River downstream from Glenmore Dam without unreasonably raising the upstream water levels above the natural levels that would exist if the channel were well maintained.

(b) Floodplain:

The land located immediately adjacent to the floodway which is not needed for the conveyance of the designated flood but which is, nonetheless, subject to inundation.

B2.1.9.2.3 Floodway and floodplain limits were accepted by the Province and City Council in June 1974 as a part of the current Floodplain Management Policy of Council. The floodplain management policy (refer to Section C1.2 of 'The Plan and Policies') is also based on the above floodway and floodplain limits used in connection with certain development controls exercised by the City of Calgary since June 1974. The recommended policy is sufficiently flexible that it can be applied not only to the Bow and Elbow Rivers, but to Nose Creek and West Nose Creek as well.

B2.1.9.2.4 At this stage, only floodplain boundaries for the Nose Creek and West Nose Creek within the city limits have been determined. However, the Alberta Department of the Environment has initiated a study of the Nose Creek Basin, which will include the following:

- determination of the feasibility of regulating the flow of Nose and West Nose Creeks
- assessment of water quality and erosion problems and potential, and the examination of possible mitigative measures
- development of a stormwater management policy for the basin, particularly with respect to the City of Calgary.

It is estimated that the above study will be completed by the end of 1981.

B2.1.9.2.5 Advisory guidelines are recommended (not mandatory) for a detached single-family house exempted from complying with Policy B.1(i) of the Floodplain Management Policy because it would require special design modifications due to the lack of necessary anchorage and the massiveness required

to resist lateral forces resulting from ground water pressure in the event of a major flood. This will minimize social and economic hardships to existing small residential property owners and will also help to maintain the present overall character of existing riverside residential communities.

B2.2 CRITERIA FOR DETERMINING THE COMPATIBILITY OF FLOODWAY USES

B2.2.1 Floodway: The present channel plus those portions of land needed to convey a designated flood of 80,000 cubic feet per second for the Bow River upstream of its confluence with the Elbow River, 110,000 cubic feet per second (with a probability of occurrence of once in 70 years) downstream of the confluence; and 20,300 cubic feet per second (with a probability of occurrence of once in 100 years) for the Elbow River downstream from Glenmore Reservoir Dam, without unreasonably raising the upstream water levels above the natural levels that would exist if the channel were well maintained.

B2.2.2 Factors Considered

1. Type of land uses, related to the actual use of the rivers and creeks:

   As far as possible, land uses in the floodway should be complementary to actual uses of the rivers and creeks.

   The most appropriate land use related to water-based activities such as boating, canoeing, kayaking, and fishing is open space in the form of parks and trails. Where other uses exist they should ideally be related or not in conflict with water uses.

   Opportunities for integration exist even where the land adjacent to the river is in recreational use. Potential conflicts must be identified as, for example, between noisy intensive uses and passive solitary uses; a picnic area should not be located immediately adjacent to a quiet trail or popular fishing stretch.

   By adopting the above approach, major public recreational areas and/or facilities can be appropriately integrated to serve the recreational needs of different communities in an economical manner.

2. The impact of land uses on the natural environment of the rivers and creeks (conservation and enhancement potential):

   Any possible land use impact on the natural environment of the river/creek must be recognized as a major concern particularly with respect to environmental pollution. Land uses permitted in the floodway should have conservation and enhancement potential related to the natural environment of the rivers/creeks and their use so that any unavoidable damage is either minimized or eliminated. Land uses should not act as deterrents to water-based recreational activities, pose any threat to wildlife or affect the quality of the water.

   Such land uses as natural areas, golf courses and other types of related general open space are compatible uses which have no negative impact on the natural environment of the rivers/creeks. Such uses would be attractive to the general public. Care must be taken to maintain the existing qualities of the

creek/riverbanks and floodway areas and to enhance the general environment of areas affected. For example, land uses requiring heavy use of motor vehicles (e.g. sod farming, campsites) should not be located adjacent to natural areas with restricted vehicular access.

3. The effect of the floodway limits on adjacent land uses:

   The floodway land forms an area which, in the event of a major flood, is required in addition to the river channel to convey a flood of designated magnitude. In order to ensure a free flow of flood waters, it is recommended that no development of a structural nature (excepting utilities, and river crossings) be permitted within the floodway unless it is non-obstructing. The extent of the floodway must be taken into account when determining the location of possible uses along the riverbank.

4. Environmental impact of development on the floodway and its use:

   In determining compatible floodway uses, consideration must be given to any possible negative impact which proposed development may have on the floodway or its actual use. Land uses should not damage existing natural vegetation or adversely affect the general natural setting of the creek/ riverbanks. In order to achieve this, public recreational facilities such as pedestrian walkways/pathways should be carefully located in relation to natural areas as well as any other existing development adjacent to the creeks/ riverbanks to avoid vandalism and any possible threat to wildlife existing in natural areas and environmentally significant areas. Future development should not discourage public utilization of the creeks/riverbanks for active or passive recreational purposes. For example, sewage outfalls discharging partially treated effluent into the creeks/rivers would discourage public use of the adjacent creeks/riverbanks.

5. Flood damage potential:

   Development permitted in the floodway areas should be of a nature which will not result in substantial damage costs or require major relocation in the event of a major flood. Open space land uses requiring no structures at all are the most appropriate use of floodway land as the damage costs incurred in a flood will be relatively low.

6. Potential hazard to downstream properties and other features in the event of a major flood:

   Developments of a structural nature pose a serious threat to downstream properties and other features and would also have a negative effect on the upstream channel.

7. Location of uses in relation to the natural processes of rivers and creeks:

   As water is a powerful erosive agent which always takes the line of least resistance, careful consideration must be given to the natural processes of rivers/creeks - the stage of life cycle, their morphology and fluvial processes. Areas susceptible to undercutting, slumping, or eventual separation

from adjacent lands should be identified and retained as natural areas or as public open space with no structures.

8. Whether floodway land uses facilitate public access to the rivers and creeks:

Riverside open space uses such as golf courses, public parks, natural areas and picnic grounds usually facilitate public access to and along the watercourses either in the form of pedestrian walkways/pathways or service roadways for vehicles. In general, open space uses minimize potential conflict between public access and designated land uses. In the case of natural areas, pedestrian access should be maintained if required and vehicles prohibited, although parking areas should be provided within a reasonable walking distance.

9. Traffic generations (pedestrian and vehicular) as a result of floodway uses:

It is desirable to create and maintain public access to the watercourses in the city but precautions must be taken to prevent heavy volumes of vehicular or pedestrian traffic which may have negative impact on the creeks/riverbanks and adjacent areas of environmental value. Heavy vehicular traffic may conflict with pedestrian use and cause environmental pollution. Intensive pedestrian use can cause trail and creek/riverbank denudation and involves a high risk of vandalism. Therefore, wherever possible, vehicular and pedestrian uses should be segregated and pedestrian areas likely to receive extensive use should be located away from private properties and environmentally significant areas.

D2.3 On the basis of the above factors, examples of land uses which may be considered as compatible floodway uses are itemized in Section B1.2.2.3 of the 'Supporting Information'.

B2.3 REMOVAL OF INCOMPATIBLE RIVERSIDE LAND USES EXISTING IN AND ADJACENT TO THE FLOODWAY

B2.3.1 Definitions

Riverside Land: Area adjacent to the creek/riverbank.

Riverbank: Sloping area abutting the river/creek channel.

B2.3.2 Existing Policy

The current floodplain management policy (Appendix II) was adopted by City Council on June 24, 1974, and policies concerning the removal of "incompatible riverbank uses" are stated below:

Floodway:

"That a policy be adopted to encourage the relocation of incompatible industrial development from the floodway and floodplain."

Incompatible Riverbank Uses:

"That the City adopt a policy for removal of incompatible riverbank use, commencing in 1975 and spread over a ten year period, and that the Provincial Government be requested to cost-share in the program."

Incompatible riverbank uses mentioned in the Calgary Bow River Study Committee Report, January 1974 (amended and approved in principle by City Council in June 1974) include gravel mining operations, feed lots, oil refineries and other industrial concerns incompatible with riverbank land in an urban setting; dumping, storage and the use of hazardous materials in the floodplain. Additionally, land uses which are considered incompatible with riverbank land in an urban setting are gravel processing, manufacturing of concrete products, commercial parking lots, transportation terminals, manufacturing of toxic goods, dumping of garbage and trash, gas service stations, auto-body repair shops, car sales and service lots, railway yards and other similar industrial uses. Normally, such uses have a negative impact on the riverine environment in an urban setting in terms of aesthetics and pollution problems.

B2.3.3 Discussion

Compared to the Bow River, there are only a few locations along the Elbow River adjacent to the C.P.R. bridge (9 Avenue S.E.) where the existing industrial uses are incompatible with the riverbank land. In the case of Nose Creek, industrial uses are generally located close to the creek channel without adequate setbacks (e.g. north and south of McKnight Boulevard). Excepting the recent residential development south of West Nose Creek, agricultural activities are the main land uses along the creek valley. In accordance with the existing policies, development setbacks from the top-of-the escarpment have been provided, where possible.

It must be emphasized that riverside uses such as parking lots in many instances are associated with recreational facilities such as Bowness Park, William Pearce Estate, and the Zoo along the Bow River; and Glenmore Athletic Park, River Park/Sandy Beach, Stanley Park and Lindsay Park along the Elbow River. These parking areas form an essential part of the overall functioning of the aforementioned parks. In this case, adequate landscaping (trees, shrubs and/or berms with suitable plantings) can be provided, so that they blend in suitably with their surroundings. Therefore, these types of parking facilities should be recognized as compatible with the riverbank land.

The remaining incompatible riverside uses of an industrial nature such as feed lots, oil refineries, and gravel mining and processing operations cannot be adequately treated in order to eliminate environmental concerns regarding odour, undesirable aesthetics, noise and pollution problems. Although certain remedial measures might have been taken to reduce or alleviate these concerns, no improvements of any significance have been observed to date.

Currently, there are two major industrial firms located within the floodway of the Bow River, namely Supercrete Ltd. (situated west of the Bow River, immediately north of Glenmore Trail S.E.) and Conmac Ltd. (south of Southland Drive and directly west of the Bow River). These two industrial companies process gravel and manufacture concrete products. According to the current floodplain management policy of City Council, the above industrial uses are incompatible with the riverbank land. As a result of the Deerfoot Trail construction, the Conmac property will become isolated from the surrounding land uses and vehicular access to this development will be circuitous.

B2.3.4 Public Concerns

It is generally perceived that the least desirable land use is polluting industry located in the valleys. Citizens have expressed their desire to curb industrial development along the rivers and creeks because of potential pollution and access problems. Citizens felt that the present industrial sites along the rivers and creeks are poorly maintained, and new industrial development along Nose and West Nose Creeks will cause further deterioration of the water quality and river/creek valleys. Additionally, citizens have stated that industries should be forced to move from riverbank property and relocate in areas less desirable for family life. Moreover, the public felt that there should be no industrial development upstream from water reservoirs.

At the Open Houses held in May/June 1979, Calgary River Valleys Plan Questionnaires were made available to the general public. Question No. 3 asked:

> "Should incentives be offered to encourage industries, institutional and commercial businesses to relocate from lands adjacent to Calgary riverbanks to other areas of the city?"

Out of approximately 500 questionnaires received, 79% of respondents answered 'Yes'; 15% No, and 6% were 'Undecided'.

B2.3.5 Review of the Effectiveness of the Existing Policy

It is noted that after City Council adopted a policy regarding the removal of "incompatible riverbank uses" in June 1974, relocation of such uses or rehabilitation of gravel pits through reclamation has not occurred on a voluntary basis, and that enforcing a specific rehabilitation program will not be a practical approach in this regard because the parties involved will not have the opportunity for proper negotiations. On the other hand, it can be considered a major incentive for industries to relocate to other areas with adequately serviced industrial land owned by the City. However, since the City does not own sufficient serviced industrial land to offer in exchange, in areas most suitable for the industries in question, this type of incentive cannot be offered to encourage industries or other commercial businesses to relocate from lands adjacent to the creeks/ riverbanks.

Another factor which seems to prevent the City from implementing the relocation or removal of incompatible industrial uses is the substantial cost associated with these major undertakings.

Since 1975, no significant changes have been observed in terms of the rehabilitation of any gravel pits or the relocation of incompatible riverside uses (e.g. gravel processing, concrete block manufacturing plants and gravel extraction operations adjacent to the Bow River). However, it should be noted that the City of Calgary has, on an opportunity basis, acquired approximately 350 acres (141.75 ha) of land adjacent to the Bow River from P. Burns Ranches and Imperial Oil Ltd. These areas are located opposite to Southland Drive west of the Bow River and immediately east of the Bow River south of the Bonnybrook Bridges, respectively.

B2.3.6 Conclusions

It is appropriate for the City of Calgary to continue with its current policy of acquiring land to facilitate the gradual removal of existing incompatible riverside

uses. It is emphasized, however, that with respect to incompatible industrial uses existing in the floodway, the City of Calgary should request the Province to share in the cost of acquisition as it is the intention of the Province, within their powers to protect the flood control areas (Water Resources Act) while land use planning in the floodway remains under the jurisdiction of the City of Calgary.

In order to prevent future incompatible riverside uses, it would be advisable to establish compatible floodway land uses, examples of which are specified in Section B1.2.2.3 of the 'Supporting Information'. In the event of industrial development occurring in areas immediately adjacent to the floodway of the Bow River in the southeast part of the city and in the Nose Creek valley, only restricted light industrial uses should be permitted. Future industrial development should be subject to development controls based on performance standards, exterior architectural design, and height restrictions in relation to development already existing adjacent to the river and creek valleys. Furthermore, uses such as commercial parking lots, oil refineries, gravel extraction pits, dumping of junk materials and the storage and the use of hazardous materials should not be permitted in flood prone areas.

Additionally, it is advisable to establish guidelines to determine the appropriate location of future uses within the valleys in relation to the existing surrounding land uses. The aim is to create a harmonious pattern of development in the river/creek valleys which would reflect a gradual transition in terms of scale and compatibility of future riverside uses in an urban setting.

Recognizing that the rivers and creeks are to be the focal points of year round recreational activities, the possible future land uses within the valleys can be based on the guidelines included in Section B3.1 of the 'Supporting Information'.

B3 TRANSPORTATION CORRIDORS ADJACENT TO THE WATERCOURSES

B3.1 Present Conditions

B3.1.1 The Bow River

Within the Inner City section of the Bow River there are two major roadways, namely Memorial Drive and Bow Trail located north and south of the river respectively. On both roads a series of road widenings has reduced the width of the existing riverbank parkland.

To extend Memorial Drive westwards a right-of-way which passes along Parkdale Boulevard and adjacent to the river south of the Point McKay development has beenr etained as a long term proposal to connect with the Trans Canada Highway west, at the intersection of Bowness Road and Shaganappi Trail. The proposed Memorial Drive extension will be a four to six lane facility and the adjacent riverbank parkland will be affected. However, it must be noted that as an alternative to the Memorial Drive extension, the feasibility of utilizing the existing 3 Avenue N.W. is currently being examined by the Transportation Department.

The riverside land may also be affected when Bow Trail is upgraded and extended west to connect with the existing 4 Avenue S.W. and 5 Avenue S.W. one-way system because no public land is currently available south of the existing roadway alignment. It should also be noted that landscaping will be done between the existing riverbank and the proposed upgrading.

This was one of the major concerns expressed by citizens at the public meetings held in November 1978 and January 1979, and at the Open Houses held in May/June 1979.

B3.1.2 The Elbow River

As mentioned in the 'Land Use Inventory and Analysis' part of this report, major roadways, such as the proposed 26 Avenue S.E. connector adjacent to the Elbow River between 1 Street S.E. and 6 Street S.E., 26 Avenue S.W. between 1 Street S.W. and 4 Street S.W.; Elbow Drive between 4 Street S.W. and 29 Avenue S.W.; and Sifton Boulevard located between 7 Street S.W. and 9 Street S.W. impinge upon the riverbank parkland adjacent to these transportation corridors.

Most of the above mentioned roadways are situated too closely to the riverbanks, and as a result of a series of road widenings, the width of the riverbank parkland has been drastically reduced in certain cases. In some instances where the width of such parklands is constricted and the riverbank is steep, it is difficult to effectively utilize the remaining flat parks of these narrow strips of parkland for pedestrian trails or other forms of active recreational facilities.

Furthermore, exhaust fumes emanating from vehicular traffic using major thoroughfares, located either in the river valleys or immediately adjacent to the top of the riverbanks, add to environmental pollution in the areas affected. Due to the location of major roadways with high speed limits between residential communities and the river valley, pedestrian access to the river valley, at grade level, is hazardous for children and the elderly in particular.

B3.1.3 Nose Creek

As a result of the existing Deerfoot Trail and the C.PR. line paralleling the course of the creek, public access to Nose Creek is very hazardous between the Bow River and 80 Avenue N.E.

B3.1.4 West Nose Creek

Although there are no major roadways existing adjacent to the creek, the Beddington Trail (Expressway) is planned to run east-west paralleling the creek on the south side. This expressway will connect with Deerfoot Trail directly north of the 80 Avenue N.E. alignment. According to subdivision plans, the setback from the creek is an average of 200 feet (61 m). Since there is sufficient right-of-way retained for a four to six lane facility, no major problems are anticipated concerning future road widenings affecting the parkland strip between the creek and the road right-of-way. With respect to future transportation corridors, it should be ensured that setbacks are provided adjacent to the watercourses as per the Floodplain Management Policy.

B3.2 Discussion

Generally, the concept of locating roadways parallel to watercourses is neither new nor undesirable. The main objective of locating roads with low speed limits adjacent to river valleys was, and still should be, to create an opportunity for motorists to enjoy riverside scenery while driving at low speeds. The general character of such roadways is that of a local minor street with two lanes (one in each direction) and tree planted boulevards on either side of the street.

Following are a few examples from Canada and other countries concerning roadways adjacent to rivers which are normally located at a distance of approximately 300-500 ft. (91 - 152 m) away from the river. South of the Parliament Buildings in London, England, the Victoria Embankment is separated from the banks of the Thames River by a linear public park which accommodates mainly passive recreational activities. In Edmonton, most of the roadways adjacent to the North Saskatchewan River within the city limits are located 400-500 feet (122 - 152 m) away from the river. According to the Province of Saskatchewan Planning Act, the required development setback from the rivers and streams is 300 feet (91 m). Even in the case of roadways constructed prior to this Act, sufficient setbacks were provided to permit retention of existing riverside vegetation, e.g. Spadina Cresent E., west of the College Drive bridge in Saskatoon.

In all of the above cases, by maintaining desirable setbacks from the watercourses, a 'usable' parkland strip was created adjacent to the riverbanks for active and passive recreational activities.

Riverside roads should have interesting design characteristics with respect ot their alignments paralleling the natural boundaries of river valleys. Normally such roadways should not permit short cuts for motorists through adjacent areas. Where major transportation corridors are parallel to the rivers, a barrier is created between the rivers and the adjacent residential communities.

Any road widening, if necessary, should occur away from the riverbanks. Prior to actually planning riverside roadways adequate rights-of-way should be retained. Some land within the rights-ofway should either be retained in the form of a buffer strip located away from the riverbank, or included in the center median for possible future road widening purposes. By this simple expedient, any necessary road widenings can avoid unnecessary encroachment on riverbank parklands and/or adjacent riverside private properties.

C WATER RELATED CONSIDERATIONS

C1 WATER-BASED RECREATION

Note: According to the Parks/Recreation Department a consultant was hired to explore opportunities relating to water-based recreation in the City of Calgary. Regarding the study, the Department should be contacted.

C1.1 Overview

Water-based recreation denotes those activities dependent upon some form of contact with water. Presently, water-based recreation on Calgary's rivers includes canoeing, fishing, wading, and rafting. The use of inflatable dinghies and inner tubes ('tubing') also takes place in some areas and swimming occurs at a number of restricted locations.

Water is a natural focus of attraction for recreational activities. Southern Alberta has relatively few lakes and rivers in comparison with other parts of Canada; these resources accordingly support generally greater intensities of recreational use than elsewhere. This is particularly true of urban rivers and lakes.

Currently, there is a general lack of water-based recreational facilities adjacent to Calgary's watercourses, e.g. boating and clubhouses, canoe launching points, lagoons for swimming, fishing and boating, and whitewater canoe training courses.

C1.2 Public Concerns

A number of comments were related to water-based recreation during the course of the public participation program. The preliminary concept plans displayed at the Open Houses in May and June, 1979 indicated a number of possible canoe launching sites and courses, possible sites for a swimming lagoon in the Sandy Beach area, and two large multi-use lagoons in the southeastern part of the city (Barlow area). Whilst reaction to the latter was entirely positive, a minority of the public expressed reservations regarding the proposed canoe facilities and the swimming lagoon. These related primarily to possible adverse environmental impacts.

A summary of questionnaire responses prepared following the Calgary Urban Shorelands Seminar held in September 1978, stated: "Since water is always a fascination to people, it can be capitalized by allowing as wide a variety of passive and recreational pursuits as possible..."

Additionally, a number of general concerns were expressed by the public regarding the present and future sports fishing capability of the Bow River. The Alberta Canoe Association also expressed the desire for the provision of canoeing facilities (refer to Appendix XX).

The Calgary River Valleys Plan questionnaire distributed at the Open Houses contained no specific questions related to water-based recreation. However, a number of people took advantage of the opportunity to comment. Issues raised included the possibilities of fish-stocking the rivers and restricting fishing to avoid the depletion of stock, as well as the possibility of installing signs at popular fishing locations indicating quotas and close season dates. Also, doubts were expressed concerning the effectiveness of the fish ladder adjacent to the W.I.D. weir.

Canoeing, rafting, 'tubing', fishing, swimming, ice skating lagoons, and competitive rowing courses were generally perceived to be desirable uses.

C1.3 The Bow River

A boat rental concession operates on the lagoon and adjoining channels in Bowness Park hiring out paddle boats and canoes. A similar concession operates on the lagoon by Prince's Island Park hiring out paddle boats. The Bowness Park lagoon is maintained as an ice-skating rink during the winter months by the Parks/Recreation Department and receives very heavy levels of use. The Prince's Island lagoon was maintained as an ice-skating rink in 1970 but problems existed with storm sewer outfalls and occasional inundation due to ice jams on the Bow River.

Canoeing is popular along the entire length of the Bow River in the city, most commonly from Bearspaw Dam to the William Pearce Estate and from this estate to Fish Creek.

Fishing also takes place along the entire length of the Bow River. Access to riverside areas for fishermen is generally good, though restricted in those areas where privately owned lands abut the river, notably much of the right bank in Bowness, west of Edworthy Park, much of the riverbank adjacent to Shouldice Athletic Park and the majority of lands in the southeastern part of the city. No fishing is permitted between the Cushing Bridge (17 Avenue S.E.) and the southern boundary of the Inglewood Bird Sanctuary. The Bow River in the city is closed to fishing between April 1 and May 31 inclusive each year. There are also catch limits of 2 trout and 10 Rocky Mountain Whitefish per day. In addition, 'possession limits' are in effect. This refers to the maximum number of fish that an angler may have in his possession at any one time, either on his person or elsewhere. The possession limit for trout is 2 and for Rocky Mountain Whitefish is 20. (Alberta Fish and Wildlife, Guide to Sportfishing Regulations, 1980).

The Buoy Busters Club uses the lagoon on the left bank of the Bow River south of Graves Bridge for testing model sailboats. The present use may be combined with such activities as swimming, sailing, canoeing, paddling, and skating.

Little swimming takes place in the Bow River since it is generally swiftly running, deep and cold, with powerful undercurrents in some locations. South of the Bonnybrook Sewage Treatment Plant there are a number of places where these conditions in themselves would not prevent swimming, however, the water is of very poor quality and thus unsuitable for primary (body) contact recreation.

C1.4 The Elbow River

Swimming and wading are popular summer activities primarily in the Sandy Beach area while rafting and 'tubing' take place along the entire length of the river. Canoeing is possible in the spring when the snows are melting but in the summer and autumn water flow levels are generally too low to permit full enjoyment of this sport.

Fishing is popular along the entire length of the river. Access to the riverside is generally more restricted than along the Bow River but there are few locations where fishing from at least one riverbank cannot take place.

C1.5 Nose and West Nose Creeks

Opportunities for water-based recreation are virtually non-existent at present. The creeks are small and shallow with very low water flows during most of the year. Water quality is extremely poor and unsuitable for primary contact recreation (e.g. swimming, wading).

The Alberta Department of the Environment is presently conducting a comprehensive study of the Nose Creek Basin. Stormwater management and water quality are issues which will be addressed and the information collected will be instrumental in determining the potential for and desirability and feasibility of encouraging water-based recreational activities. It is anticipated that the study will be completed by the end of 1981.

C1.6 Limiting Factors

From the above discussion it is evident that water-based recreational activities in the City of Calgary on, in, and adjacent to the watercourses are fairly restricted. It is possible to identify broad limiting factors, the watercourses to which they apply, and the activities which are adversely affected. From this base, it is then possible to determine what potential exists for enhancing

water-based recreational opportunities in the river and creek valleys.

(i) Access: At present, there is no public access to many of Calgary's riverside lands. This is discussed in further detail in Chapter B1.2. However, restricted access in some locations may be beneficial in terms of protecting a resource e.g. fish spawning grounds.

(ii) Temperature: Information concerning temperature and other physical characteristics of the rivers and creeks is given in Section A of the 'Supporting Information'. Generally, the larger the river the greater the length of time required for water temperature to rise in the summer (and conversely, to cool down in the autumn). Water temperature is a limiting factor on all of Calgary's watercourses, primarily affecting swimming and wading.

The winter freeze obviously prevents most water-based activities from occurring. Ice fishing, ice skating, cross-country skiing and snowshoeing are possible on certain sections of the watercourses in the winter but are not advisable. Ice conditions on Calgary's rivers are unpredictable. There are always numerous 'thin spots' and the potential for tragedy is high.

(iii) Velocity and Depth: This applies predominantly to the Bow River but the Elbow River can also be treacherous, particularly during the spring melt. All water-based recreational pursuits with the exception of canoeing are adversely affected.

(iv) Water Quality: Poor water quality conditions exist predominantly in the Bow River south of the Bonnybrook Sewage Treatment Plant and throughout the Nose and West Nose Creeks. Swimming, wading, 'tubing', and to a lesser extent canoeing and fishing are all adversely affected.

(v) Water Flows and Fluctuations: All the watercourses and water-based recreational activities are adversely affected by low water flow levels although the adverse implications for recreational activities are lowest on the Bow River.

C1.7 Canoeing and Fishing

Canoeing and fishing are the two most popular water-based sports on Calgary's rivers. Both attract increasing numbers of participants from all age groups and from both sexes. Because of the predominance of these two activities, both merit special attention in this section.

C1.7.1 Canoeing: This is the only physically demanding water-based sport on the Bow River. There is close liaison between the Canadian Canoe Association and the Alberta Canoe Association, and a number of local canoe clubs have been established in the Calgary area. The Glenmore Reservoir is extensively utilized for canoeing as is the private lagoon developed by the Al Azhar Lodge. Canoeists have expressed a number of concerns related to the provision of facilities to enhance the canoeing potential of the rivers. Present problems relate to the lack of formal launching sites as well as whitewater training courses.

C1.7.2 Fishing: Sports fishing is generally considered to be excellent throughout the Bow River in the City of Calgary. It is a sport which can be enjoyed year round as the Bow River in the southeast part of the city usually remains ice free during the winter months due to thermal pollution from the sewage treatment plants. Rocky Mountain Whitefish are the most prolific species and are

easily caught. A number of other game fish, notably Rainbow Trout and to a lesser extent Brown Trout also provide good sport and are much sought after. Numerous coarse fishes are also present in the rivers although most anglers concentrate on the game fishes. Pike can also provide first class sport.

In November 1979, a report entitled "Sports Fisheries Within the City of Calgary" was produced by the Fish and Wildlife Division of Alberta's Department of Energy and Natural Resources for the Calgary River Management Advisory Committee. This report gives a good overview of the present sports fishing situation within the city, including survey data concerning the number of anglers, and the various species caught. It also identifies major problems affecting the resource. The information contained in the report is accepted and endorsed and is included in Appendix VI. Rather than repeat this information, the following discussion briefly addresses expressed public concerns and major problem areas.

According to the Provincial Fish and Wildlife Division, the fish ladder by the W.I.D. weir is an effective facility. Counts are regularly made of the numbers of species passing up the ladder. It is readily utilized by the major game fish as well as by coarse fishes such as pike. However, downstream of Calgary, design problems relating to the effectiveness of the tailwater impede the utility of the Carseland dam and this may have some effect on the numbers of species passing upstream into the City of Calgary.

Currently, there is no need to stock Calgary's rivers with fish as sufficient species exist naturally in considerable numbers. Stocking the river with non-native species can have a deleterious effect on existing species by displacing their habitat. Additionally, in a river such as the Bow where the present species are well established and generally vigorous and healthy, it is extremely doubtful that introduced species would survive.

There are a number of problems relating to the sports fishing capability of Calgary's rivers. These result from several interrelated factors. A good example is the problem of habitat exclusion. This is a condition whereby a species' habitat becomes uninhabitable. This situation occurs most notably in the lower reach of the Bow River in late summer and autumn following periods of dry, warm weather. Low water flow levels result from low rainfall and massive abstraction of water for municipal and irrigation purposes. The effects of pollution become more noticeable particularly with respect to the phosphorous and nitrogen loadings from sewage which enrich the water causing algal blooms and weed growth. The effects of both low water flow and pollution combined with warm water temperatures result in a decrease of oxygen content in the water and an increase in water temperature. The effects on the fish are cumulative. Game fish such as trout and whitefish prefer swift running and relatively deep water; they require a highly oxgenated environment, relatively cool temperatures and specialized conditions for spawning and resting. Under the scenario described above, any or all of these conditions may not be met. In particularly bad years, this can result in extensive fish kills and the remaining weakened fish have a reduced chance of surviving the harsh conditions of winter.

Several problems relate to spawning. Rainbow Trout spawn in the spring while both Brown Trout and Rocky Mountain Whitefish spawn in the autumn. The traditional trout spawning grounds are in the high mountain streams. There are no fish ladders on either the Glenmore or Bearspaw Dams. Downstream of Calgary there are dams on the Bow River at Carseland and Bassano. However, there is no fish ladder on the Bassano dam. Consequently, the Highwood

River, Fish Creek and their tributaries are the only remaining watercourses from which access to the traditional spawning grounds can be obtained. In spring, water flow levels are usually adequate to allow the upstream migration of Rainbow Trout. This is not necessarily the case in the autumn when Fish Creek frequently dries up and there is considerable extraction of water from the Highwood River for irrigation purposes. Allied with the effects of habitat exclusion occuring within the city, this can create a precarious situation for the autumn spawning species. Fortunately all species will spawn in the city, notably in the Bow River below Bearspaw Dam. This reach of the river is free from sewage effluent although low water levels can occur, as they did in the autumn of 1979. Very little spawning takes place in the Elbow River during either spring or autumn since the river is subject to considerable water flow fluctuations which produce unfavourable spawning conditions.

Some problems inevitably exist concerning the manner in which the resource is utilized by anglers. A decade ago, there were very few fishermen compared to today and the emphasis was clearly upon trophy fishing. Increasingly, fish are now caught in greater numbers for eating although many find the fish to be unpalatable as a result of poor water quality. The rivers are regularly patrolled by wardens but enforcement of catch limits and the close season dates becomes more difficult as the number of anglers increase. There have been reports of some anglers taking fish in almost commercial quantities. Also, much of the fishing is bait fishing which results in higher kills due to swallowed hooks as compared to fly fishing or spinning.

C1.8 Implications and Opportunities

From the above discussions it is evident that without basic changes in the fluvial regime, water-based recreational activities on Calgary's rivers will remain very limited. Changes in such essential characteristics as speed of flow, depth and temperature are, for all practical purposes, very improbable. Consequently, the potential for enhancing such primary contact activities as swimming, diving and wading remains minimal. However, there is considerable potential to both improve and protect existing recreational opportunities provided by the two major water-based sports of fishing and canoeing. Also, a much greater variety of water-based sports can be encouraged close to the rivers and creeks by the selective development of multi-use lagoons. These possibilities are discussed below.

C1.8.1 Canoeing: Canoeing is a sport which demands discipline, provides exercise and adventure, and encourages individuals of all ages and both sexes to appreciate the value of outdoor recreational activity. It can be enjoyed as an individual or group activity, as an occassional pastime or as a serious sport. Accordingly, it is an activity which should be encouraged in the city to the extent that it is complementary with other uses such as fishing and does not have adverse impacts on the natural aquatic environment.

A possible location for a whitewater canoe training course exists downstream of 10 Street S.W. This would necessitate the installation of gravel filled mesh bags on the bed of the river in a slalom-type arrangement. Such a facility would not only help the sport but would have interesting spectator possibilities, being highly visible from Memorial Park, Prince's Island and the downtown bank of the Bow River. It would add 'life' to the downtown area on weekends and in the evenings. A second possibility for a training course exists downstream from the Pearce Estate, adjacent to the Inglewood Golf Course and connecting to the W.I.D. canal. However, the above

possible locations need to be further evaluated. It is also desirable to have a number of canoe launching sites at suitable locations on both the Bow and Elbow Rivers to facilitate access to the rivers by groups of canoeists. This would ensure that group launching does not take place on an ad hoc basis, possibly inconveniencing other riverside users such as fishermen, joggers, and cyclists. Such sites would not require the installation of facilities such as concrete launching pads or mooring facilities, but rather a formally designated parking area conveniently located close to the riverside.

Implementation of any or all of the above possibilities must be contingent upon the avoidance of adverse environmental impacts. For example, it will be necessary to determine that creation of a whitewater canoe training course would not have adverse impacts on either the fishery or the flow characteristics of the river to the extent that the flooding hazard might be increased. Similarly, launching sites or any other related facility must not be located in any environmentally sensitive areas such as waterfowl nesting sites or fish spawning areas.

C1.8.2 Fishing: The existing sports fishery is one of Calgary's major recreational assets. McLean's Fishing Diary (A.J. McLean, 1975) states that the Bow River is one of the two best trout streams in North America. To date, the fishery has remained good despite the multifarious side effects of urbanization. If the present trend of rapid urban growth continues, this is not a situation that can be expected to continue indefinitely without a much more active process of management allied with a strong determination to redress such impacts as poor water quality, low and fluctuating water levels and abuse of the resource by some anglers - all of which clearly have a deleterious effect on the resource and threaten its future viability. Calgary's sports fishery is an outstanding and unique resource which is arguably unparalleled by any other major North American city. It is probably irreplaceable. It is an asset of which Calgarians can be proud and which clearly requires safeguarding. Its demise through neglect would constitute a great loss to the city.

It should be noted that a number of the problems related to the viability of fish populations, notably water quality and the water flow regime, are also issues of general concern directly affecting not only other water-based recreational activities and aesthetically influencing numerous water-enhanced recreational pursuits, but also having negative environmental impacts on the water for downstream users. For example, the City of Medicine Hat is dependent upon the South Saskatchewan River for its municipal water supply and has repeatedly expressed concern about the quality of water imparted to that river from the Bow River. Also, weed choked irrigation channels can create serious agricultural problems.

Because the virility of fish populations is generally considered to be a fairly sensitive indicator of the total health of an aquatic ecosystem, any future attempts to ensure that the sports fishing capability of the city's rivers remains viable can also be seen as directly contributing to the resolution of certain other water-related problems. Accordingly, the exploration of issues related to the sports fishery should not be considered in isolation but as an integral component of an overall water management strategy.

C1.8.3 Lagoons: Given that water-based recreational use of Calgary's rivers is likely to remain restricted and given that there is clearly the demand for a wide variety of water-based pursuits, the possibility of utilizing natural and artifical lagoons for recreational pursuits should be given serious consideration. Such lagoons, of course,

need not be restricted to riverside locations. However, lands in close proximity to the rivers and the adjacent flood prone areas are obvious locations for such facilities since this is where the focus of regional recreational activities does and can be expected to continue to take place in existing (and proposed) riverside parks and parkland.

The advantage of lagoons is that supervision is much easier to ensure than on the rivers. Also, lagoons can be designed to cater to a wide variety of active and passive recreational activities. Examples of the types of uses which can take place include ice skating, ice hockey and ice sailing, sailing and wind surfing, model boat sailing, fishing, swimming, wading, the hiring out of boats and canoes, and canoe training and racing courses. With proper design, multiple uses can take place at any one location. The possibilities are exciting but it should be emphasized that it is desirable that the future development of any such lagoons in the river/creek valleys should be for the use and enjoyment of the general public.

C1.9 Hazards

It is important to emphasize that any water-based recreational activity is potentially hazardous. Drowning is obviously the main concern although numerous other mishaps can occur. It is no more logical to suggest that water-based recreational activities should be discouraged than it is to suggest that all vehicles be banned because people are killed on the roads. It is, however, vitally important to attempt to ensure that all adequate precautionary measures are taken. This can be partially accomplished by appropriate design, public education programs and effective supervision but, as is frequently the case, the primary responsibility rests with the individual.

Analysis of any record of recreational water-related fatalities will indicate that the majority of such tragedies could have been prevented by simple common sense. For example, on any weekend summer day rubberized and plastic dinghies can be observed on the Bow River. The vast majority of these are merely toys and are patently unsuited for use on a river of this type. Regardless of how effective a rescue service might be, if any such craft capsizes in swift, deep water and the occupants are not strong swimmers wearing good life jackets, the likelihood of survival becomes a matter of slim chance.

The type of common sense education required is primarily a parental responsibility, although public and private bodies should also be involved. Practical experience is probably the most effective means of instruction and in this regard the safety lessons offered by specialized sporting organizations, such as canoe clubs, are invaluable. The Red Cross publishes an excellent series of information posters on water safety.

C2 WATER QUALITY

C2.1 Present Condition

As indicated in the Water Quality inventory section Section E1 of the 'Land Use Inventory and Analysis', the quality of water in the Bow River downstream from the Bonnybrook Sewage Treatment Plant is very poor. The Elbow River water quality is good whilst Nose and West Nose Creeks are seriously polluted.

C2.2 Discussion

Currently, most of the industrial effluents including the Bonnybrook and Fish Creek sewage treatment effluents are

discharged into the Bow River between the Ogden Road S.E. bridge and Fish Creek.

At present, the Bonnybrook and the Fish Creek Sewage Treatment Plants are secondary treatment facilities. During the past ten years the City of Calgary has increased its emphasis on the abatement of water pollution through the creation of new by-law regulations introducing additional programs of monitoring and upgrading the treatment of water waste. As a part of this improvement program, the Bonnybrook Sewage Treatment Plant was upgraded in 1971 to provide secondary treatment for approximately 90% of the City's sanitary wastewater. Plans are currently underway for additional expansion estimated to cost $40 million. The recently upgraded Fish Creek Plant provides secondary treatment using the latest technology in design and process control.

The city's two sewage treatment plants have the capability of removing 90% of the oxygen demanding organics, 90% of the suspended solids and about 25 - 30% of the phosphates from the city's sewage.

To ensure that sewage treatment plants are able to meet both the design criteria and the effluent water quality standards established by the Alberta Department of the Environment, on-going testing of major industrial and commercial waste effluents is carried out. This program, combined with a sewer service rebate policy, has resulted in many industries installing pre-treatment facilities to reduce sewage strengths before discharging into the sanitary sewer system. This surveillance also provides a means of controlling the discharge of materials which are prohibited in the sanitary sewers.

Based on information provided by the Alberta Department of the Environment and expressed public concerns regarding water quality and the quality of fish, it is noted that whilst water pollution in the City of Calgary is not yet serious, it is a problem which may be growing. Currently, although licensed municipal and industrial discharges meet standards formulated by the Standards and Approval Division of the Alberta Department of the Environment, surface water quality objectives (notably nutrient parameters) are not met. It is, therefore, essential to monitor water quality on a regular basis with the objective being to reduce and, if possible, eliminate water pollution problems related to the watercourses within the city limits.

The Provincial Department of the Environment is currently conducting a study to assess water quality in the Nose and West Nose Creeks and to examine possible mitigative measures. Additonally, the Department is presently conducting a water quality study of the Bow River. It is noted that phosphorous content in the Bow River and the implications of phosphorous removal from sewage effluent are part of this study.

It should also be recognized that as the city grows, stringent discharge regulations may themselves be inadequate to prevent further deterioration in the quality of water from occurring.

C3 WATER FLOW LEVELS

C3.1 The Bow River

The hourly flow fluctuations on the Bow River through the City of Calgary are dependent on the operation of the Bearspaw Dam by Calgary Power Ltd. Superimposed on the releases are the flows in the Elbow River and Nose Creek, storm runoff from within the city, sewage releases from the Fish Creek and Bonnybrook Sewage Treatment Plants and diversions to the Western Irrigation District Canal.

During the spring and summer, the daily and monthly variations generally reflect the variations in natural runoff that occur upstream on the Bow River system. During the spring, there can be considerable dampening of the snowmelt flood peak as depleted reservoir storage is regained but there is little control effected during summer rainstorms. The largest change in mean monthly water levels occurs between June and July. On the average, the mean monthly stage during July is approximately 0.5 m (1.5 ft.) higher than during June. In general, the Calgary Power operations do not produce consistent daily variations in stage on the Bow River through Calgary. Releases depend on the natural inflow to the reservoir, power demand and the frequency of unscheduled maintenance at the thermal plants (power supply picked up by hydro). However, on a month to month basis, the operation is more consistent with one of the major impacts coming between October and March when the water flow through Calgary is augmented by an additional 700 to 1,000 c.f.s. (20 to 28m^3/s).

Periodic low water flows, such as have been experienced in the City of Calgary in the last few years, in conjuction with water pollution and dam structures, may have an adverse effect on aquatic life.

C3.2 The Elbow River

Fluctuations on the Elbow River through the city are influenced primarily by the operation of Glenmore Dam. During the April to August period, the average change from month to month is approximately 0.2 m (0.5 ft.) while mean monthly flows during the autumn and winter months are fairly constant.

The amount of water discharged from the dam is carefully controlled to ensure an adequate potable water supply to meet the city's needs and to provide a measure of flood protection downstream from the dam. While every effort is made to accommodate recreational activities on the Elbow River within these vital constraints, it is often not possible to canoe along the entire length of the river because of low water levels. In some sections of the river the water level is so low that canoeists must carry their canoes for some distance. Also, the quality of aquatic life may be adversely affected by low water levels.

C3.3 Nose and West Nose Creeks

Variations in water levels occur in direct response to runoff from the Nose and West Nose Creek basins; the mean monthly flow decreases after the spring snowmelt. By the end of summer flows can be near zero. Presently, there are a few low level weirs located on Nose Creek which do not control water flow. The Alberta Department of the Environment has initiated a study to determine the feasibility of installing weirs which will control water flow. Improved water flow levels could enhance the water quality and support a richer aquatic life.

D PRESERVATION AND ENHANCEMENT OF THE RIVERINE ENVIRONMENT

D1 AESTHETICS:

D1.1 Discussion

A main attraction of the river corridors and creek valleys is their scenic qualities which are appreciated not only by tourists and travellers, but also by the people living and working in these corridors who can enjoy the views from both their residences and their places of work.

The present combination of developed and undeveloped areas adjacent to the rivers and creeks accounts, in part, for the visual appeal of these corridors. An additional positive factor is the existence of a variety of landscape features such as farmland along the Nose and West Nose Creeks and along the Bow River in the southeast part of the city, as well as steep escarpments with natural vegetation, established parks, golf courses, and natural areas along the watercourses.

Viewing scenery is not only a popular form of recreation available to the people but also one that does not entail public expenditure or normally interrupt the activities and uses that other people are currently making of the land. At the same time, if the scenic value of the corridors is to be maintained, some control over alteration to the landscape is required, otherwise its attributes will gradually be lost.

It is emphasized that protecting the landscape is not simply a question of protecting a few or the best of the features, but rather is one of maintaining an overall impression of 'openness' or 'naturalness' that still characterizes stretches of the river corridors and creek valleys. In light of this, the existing 60 foot (18 m) setback required from the top of any escarpment should be reviewed.

In view of the foregoing, the question of landscape protection should not only involve the location and type of new development but also involve conserving valuable components of the landscape. Even where development is not a potential threat, consideration must be given to protecting locations from which scenic views may be obtained as well as to protecting the view itself.

D1.2 The Bow River

Along the entire length of the Bow River corridor, the landscape is visible to varying degrees from the adjacent areas and the river itself. There are certain locations which offer commanding views of the river and the city skyline. The major viewpoint locations are identified on the land use concept plans. Opportunities offered by the Bow River for recreational driving are very limited since the flanking roadways are major transportation routes with mulitple lanes carrying heavy and quickly moving vehicular traffic.

As mentioned in the 'Land Use Inventory and Analysis' part of this report, there are uses adjacent to the river which are aesthetically unpleasant (e.g. Klippert Concrete opposite to Bowness, the City bus barns, Con-Force, Gulf Oil Refinery, C.P.R. yards, Cominco, Supercrete Ltd., Standard General and Burnco gravel pits, and the Conmac Batching Plant).

Adjacent to the above developments and other sections of the river, the riverbanks are currently unattractive mainly because of neglect, the dumping of trash and the poor quality of rip rapping. These areas must be cleaned and the riverbanks rehabilitated.

The overall impression of 'openness' and 'naturalness' is still strong in the northwest and the northeast parts of the city.

D1.3 The Elbow River

As mentioned in the 'Land Use Inventory and Analysis', the landscape along the entire length of the Elbow River is visible to differing degrees from the land and the water. There are certain locations along the top of the riverine escarpments which offer magnificent views of the river and the city skyline. Along most of the length of the Elbow River the riverbanks are predominantly natural in appearance. Opportunities for recreational driving are very limited.

In the proximity of the 25 Avenue S.W. bridge, Lindsay Park and the Stampede Grounds, the riverbanks are unsightly mainly because of neglect, the storage of junk materials and the poor quality of existing rip rapping. The riverbank areas need to be cleaned and rehabilitated.

D1.4 Nose and West Nose Creeks

Generally, the creek valleys are of visual interest but offer restricted opportunities for recreational driving because West Nose Creek is flanked by major transportation corridors such as Simon's Valley Road, and Nose Creek is flanked by Deerfoot Trail.

With respect to the Nose Creek valley, the well defined escarpments on both sides offer a panoramic view of the entire valley and the city skyline to the south. However, it must be emphasized that due to neglect and a general lack of landscaping, the existing industrial development adjacent to McKnight Boulevard is aesthetically offensive and imposes a negative impact on the potential aesthetic qualities of the Nose Creek valley. In addition, certain parts of the side escarpments are badly scarred due to the indiscriminate use of all-terrain vehicles by the general public. The escarpment slopes should be rehabilitated. The areas abutting Nose Creek are unattractive because of littering, the dumping of junk materials, and neglect. The creek banks need to be cleaned regularly.

In the case of West Nose Creek west of 4 Street N.W., the steep south-facing escarpment is the dominant visual focal point. From the top of this escarpment, north of 112 Avenue N.W., adjacent to the current city limits, there are excellent views to the west, south and east. However, it should be noted that the creek valley east of 4 Street N.W. reflects a negative impression of an otherwise significant natural area. This is mainly because of littering, neglect, and the illegal use of all-terrain vehicles by the general public.

Therefore, every effort possible is necessary to maintain and improve the scenic value of the river corridors and creek valleys by conserving elements which form vital components of the landscape and by preventing future development that would seriously affect the general landscape.

D2 NATURAL FEATURES

D2.1 The Bow and Elbow Rivers

As mentioned previously in the 'Land Use Inventory and Analysis' part of this report, the Elbow River in comparison with the Bow River has several conspicuous meanders. Both the Bow and Elbow Rivers have, on the average, well defined and fairly steep banks ranging from 15 ft. (4.6 m) to about 130 ft. (39.6 m) in height.

Riverbanks along the Elbow River are frequently moderately steep, unstable and undergoing active erosion. The river channel is sinuous with some geological outcrops and four islands. Similar to the Bow River, the Elbow River also has terrace formations along its banks, particularly downstream of Glenmore Reservoir up to 4 Street S.W. and 25 Avenue S.W.

Along the Bow River there are several gravel bars and islands. With the exception of St. George's and St. Patrick's Islands (Calgary Zoo), and Prince's Island, all the existing islands are predominantly in their natural state. Generally, the Bow River valley has three continuous levels of terraces; the first level corresponds to the valley flat which is, in some cases, fragmentary and narrow. Along the upper reach of the Bow River between 85 Street N.W. and the Bonnybrook Bridges, the river channel in relation to the valley is partly entrenched and frequently confined, has several natural islands and diagonal bars, and is split downstream in some cases. The channel pattern along the lower reach of the Bow River is also sinuous with frequent islands, mid-channel bars and diagonal bars. All the above features together, form an interesting unit of natural elements in these valleys of nature significance.

D2.2 Nose and West Nose Creeks

The West Nose Creek valley has more diversified physical characteristics than the Nose Creek valley. The escarpments are steep and well defined. East of 4 Street N.W. the valley itself is of visual interest. West of 4 Street N.W. the steep south-facing escarpment is visually dominant and offers commanding views to the east, south and west.

The erratic known as the 'Split Rock' is located on a rocky bluff south of the existing Circle Eight Speedway race course. The rock is split along its bedding planes into two main parts and a number of smaller rocks. The rock is an interesting landmark worthy of preservation.

Apart from its generally well defined side escarpments, the Nose Creek valley has several oxbow lakes which are unique physical features of this area. Similar oxbow lakes are also found in the valley of West Nose Creek. There is a large glacial erratic located between the C.P.R. line and the creek in the vicinity of the 120 Avenue N.E. alignment. This is a notable feature of the Nose Creek valley which has historical significance because it was utilized in the past as a rubbing stone by buffalo.

D3 ARCHAEOLOGICAL SITES

D3.1 Discussion

As mentioned in the 'Land Use Inventory and Analysis', Chapter F, there are 12 archaeological sites adjacent to the Bow River; 4 sites adjacent to the Elbow River; 16 sites adjacent to Nose Creek, and 6 sites adjacent to West Nose Creek. According to the Archaeological Survey Branch of the Alberta Department of Culture, no development is to be permitted in the areas shown on the Environmental Inventory Maps without consulting the above Department. Within these areas, the archaeological sites require further examination and any sites proven to be of historical significance must be preserved and properly maintained.

The above mentioned sites are located within approximately 500 ft. (152.4 m) of the watercourses.

It must be emphasized that appreciation of the common past is today becoming more apparent among the citizens of Alberta. The general public are asserting increasing pressure to have the historical traditions investigated, documented and presented to the public in the form of displays and publications. It is, however, unfortunate that key elements of this common identity are in serious danger of being lost prior to their proper integration into the overall pattern of our historical traditions.

In order to ensure that our common cultural heritage receives proper recognition, the Government of the Province of Alberta has enacted the Alberta Historical Resources Act. Among other things the Act provides the Minister of the Department of Culture with the authority to require developers to prepare an assessment of the effect of any proposed development on historical resources and to undertake such studies or modification to the development plan as may be necessary to retain important historical resource values.

D3.2 Relevant Policy

The Alberta Department of Culture Policy Statement (approved May, 1977) states:

D3.2.1 "Policy Objectives

1. To avoid unnecessary impact on all historical resource sites.

2. To preserve the most important historical resource sites wherever technically and economically feasible.

3. To promote the recovery of information and specimens of value from those historical resource sites which cannot be preserved.

In order to meet the above Policy Objectives, the following shall be considered to be the allocation of responsibilities:

D3.2.2 Policy Responsibilities

1. The developer shall be responsible for the conduct of sufficiently detailed studies in the planning stage to enable the preparation of a historical resource impact assessment report, and for the production of such a report.

2. The Historical Resources Division of Alberta Culture will be responsible for the technical and professional review of historical resource impact assessment and the preparation of review statements concurring with, rejecting or requesting a modification of such recommendations relative to

historical resource sites as cannot be avoided by the development because of technical or economic limitations.

3. The developer is responsible for the conduct of all mitigative measures deemed appropriate at historical resource sites which cannot be avoided by the development because of technical or economic limitations.

4. Where the Historical Resources Division and the developer cannot agree on appropriate mitigative measures (as above), the Minister of Culture will be responsible for the final decision as to appropriate mitigative measures to be undertaken in situations where historical resource sites cannot be avoided by a development because of technical or economic limitations.

5. The responsibilities of the developer will be the same for both government and private agencies.

In order to meet the respective Policy Responsibilities, the following shall be considered to be the normal procedures for implementation:

D3.2.3 Policy Implementation

1. At the planning stage of any major development and well prior to the commencement of any ground surface disturbance, an inventory of the historical resources to be affected by the development will be prepared by the developer utilizing information obtained from archival sources when available and field reconnaissance when necessary.

2. On the basis of this inventory the developer will prepare an historical resource impact assessment report which details the nature and location of each historical resource site, the postulated effect of the development on each historical resource site, and the proposed mitigative measures to be undertaken by the proponent to minimize the loss of historical resources relative to each site that cannot be avoided by the development because of technical and/or economic limitations.

3. The historical resources impact assessment report will be reviewed by the Historical Resources Division, Alberta Culture, prior to the commencement of land surface disturbance by the development,

which will accept, reject or request modifications to the report and its recommendations as appropriate.

4. The development will be permitted to proceed in accordance with the recommendations of an acceptable historical resource impact assessment report, provided such mitigative measures as are deemed necessary are carried out in advance of any possible modification, damage or destruction of the said historical resources."

D4 SNOW DISPOSAL

D4.1 General Background

The City of Calgary has a Winter Snow and Ice Control program. Under this program the City is responsible for removing snow from certain streets and hauling it to the disposal sites located in various parts of the city. Presently, there are eleven snow disposal sites, two of which are located directly adjacent to and along the banks of the Bow River. Of the rest, two are located in close proximity to the Bow River banks, two are located adjacent to Nose Creek between Memorial Drive and 32 Avenue N.E., one site is adjacent to the W.I.D. Canal, and the remaining four sites have inland locations (Environmental Inventory Maps). In order to minimize the overall transportation costs, disposal sites are appropriately located in relation to the areas from which the snow is removed.

Snow disposal on all the above mentioned sites is licensed by the Alberta Department of the Environment. These sites are presently unpaved, bare ground areas. Of importance to this study are the sites located adjacent to the rivers and their tributaries within the city limits.

At two sites (Bow Trail at 14 Street S.W., and Memorial Drive at 2 Street N.E.), the snow is discharged on the bank slopes of the Bow River and at the remaining sites the snow is stockpiled on land. The accumulated debris at the inland sites is hauled to the City-operated land fill reclamation areas for disposal and the sanding material is levelled to form a base for the following annual operations.

D4.2 Existing Procedures

According to the City Engineering Department, the following procedures are in force:

D4.2.1 General

a. Disposal sites are fenced and/or ditched to limit access points.

b. Access points have signs indicating the nature of the site and the provincial licence number.

c. Patrols are maintained to check and remove any hazardous materials and surface accumulation of debris which appears during the melting process.

D4.2.2 Design and Emission Standards

(Major Sites, e.g. 9 Avenue S.W. and 20 Street S.W., Glenmore Trail and Sarcee Trail S.W., and 46 Avenue S.E. and 15 Street S.E.)

a. Fences and gates are provided.

b. Low profile berms are constructed to retain surface run-off (only major sites).

c. The berms are grassed and shrubbed.

d. A large grit and sampling chamber is installed in sub-surface drainage mains at major disposal sites. The site at 9 Avenue S.W. and 20 Street S.W. will be developed for recreational purposes such as tennis and basketball courts.

D4.2.3 Monitoring

Private consulting firms are retained by the City of Calgary to conduct the snow tests as required by the Alberta Department of the Environment. Reports regarding snow tests completed by consultants together with information regarding specification for sanding material, Coarse Highway Salt, Common Fine Salt and material usage, and distribution of snow storage, are submitted to the Alberta Environmental Protection Services in Edmonton for their approval. In accordance with the Engineering Department's annual snow disposal report, no instance regarding the release of toxic substances has occurred during their snow storage operations.

D4.2.4 Snow and Ice Control

According to the Engineering Department, the City of Calgary has, as a part of the snow disposal management program, utilized the combination of the following two natural and unique features which are not experienced to the same extent in other cities in this province or in Canada which require a formal snow and ice control operation:

1. Geographic

The City of Calgary is situated at a sheltered location on the edge of the foothills of the Rocky Mountains. Major storms are usually deflected down slope to the east of the city.

2. Climate

The City of Calgary has a relatively dry climate which is largely attributable to the frequent occurrence of Chinook conditions which are characterized by warm, dry westerly winds. Although these winds are experienced throughout the year, their impact is most noticeable in the winter. As a result of the Chinook winds, there are numerous freezing and melting periods which reduce and/or eliminate the snow ground cover that may be very normal in other cities in the province.

In view of the foregoing, the City has, therefore, designed its Snow and Ice Control Operations Program based on the following:

Degree of Snowfall

Measurable Snowfall to street depth of 1 inch in Central Area	Over 1 inch depth in Central Business District	Continuing snow conditions

D6 RIVERBANK EROSION

D6.1 The Klohn Leonoff Report*

D6.1.1 Priorities for Action

In accordance with Appendix I "Calgary Rivers - Structure and Erosion Condition" by Klohn Leonoff Consultants Ltd., June 1979, problems related to riverbank erosion and the condition of structures have been identified. For the Bow and Elbow Rivers and the Nose and West Nose Creeks, areas requiring certain measures have been grouped into the following categories:

A. Those requiring immediate attention

Those areas where dangerous situations have developed or are developing fairly quickly. In this category there has been no division made between public or private facilities. There are relatively few areas that fall into this group and all should be investigated immediately.

B. Those needing future attention

Those areas where erosion is now taking place and probably will continue even if a large flood does not occur. Failure is expected at some time in the future. Also included are those areas where it is expected that severe attack or erosion would take place during a major flood, and where it is practical to carry out preventive work prior to a flood. A long term program of repair is recommended for these areas. Several structural related problems are also listed in this category.

C. Those requiring monitoring

Those areas where it is not possible to assess potential future erosion damage and where only a regular monitoring program is required. Typical examples include inadequately protected structures where attack is not expected, and riverbanks which are presently being attacked but where there is no structure or other facility in immediate danger.

Class 'A' sites requiring immediate attention are discussed in the following section. For detailed information and recommendations regarding Class 'B' and Class 'C' sites along the Bow and Elbow Rivers and Nose and West Nose Creeks, which require future attention and monitoring respectively, reference should be made to Appendix I.

D6.1.2 Bow River

Class 'A' - Immediate Attention:

"B-2,6 Right bank attack within Bowness Park will continue to be serious. Protection is required.

B-100 Concrete in the north abutment of the Bonnybrook bridge is badly cracked.

B-109 Left bank attack below Lysander Dr. could result in bank instability. Detailed investigation required." (Page 13)

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* The study includes: Stream Morphology, Hydrology, General Observations and Remedial Work Priorities.

The B-2 site is located on the right bank at the extreme west end of Bowness Park. The B-6 site is located on the right bank approximately 2,500 feet (762 m) west of 85 Street N.W.

It should be noted that in each of the above cases (B-2, B-6), corrective measures have been taken by the Alberta Department of the Environment and the City of Calgary.

D6.1.3 Elbow River

Class 'A' - Immediate Attention:

"E-41 Right bank footpath just downstream from 25th Avenue bridge is being eroded and is sliding into the river.

E-57 Timber in the central pier of the Stampede access bridge is badly crushed." (Page 13)

At the E-41 site, the walkway/pathway is being eroded and it is unsafe for pedestrians using the walkway/pathway. If no preventative measures are taken soon, the existing mature trees adjacent to the footpath will also be adversely affected and costs for the overall repairs could be substantial.

The timber in the central pier of the Stampede access bridge, site E-57, is badly crushed. Immediate action should be taken to repair the bridge structure in order to avoid any major property damage or loss of life.

In addition to the aforementioned Class 'A' sites, it must be emphasized that there are 50 Class 'B' sites along the Bow River, 16 along the Elbow River, 16 along Nose Creek and 2 along West Nose Creek which require future repair. Also there are 62 Class 'C' sites along the Bow River, 19 along the Elbow River and 13 along Nose Creek which require monitoring. These sites include structures and riverbank erosion conditions (private and public).

In view of the foregoing, it would be appropriate for the respective authorities to establish an overall program of repair for these problem areas and to take remedial measures accordingly. It is emphasized that any remedial measures to prevent erosion of structures and the riverbanks, be undertaken with the minimum possible disruption to the existing riverine vegetation and the maximum attention to overall aesthetics in terms of the methods and materials used.

E PUBLIC AWARENESS

E1 HAZARDS AND GENERAL INFORMATION RELATED TO THE WATER COURSES AND ADJACENT CITY PARKS

E1.1 Discussion

Under Section A of the 'Supporting Information', certain characteristics of the Bow and Elbow Rivers and Nose and West Nose Creeks are identified to make the reader aware of some important similarities and differences amongst these watercourses within the city limits. The

information provided may be basic but it is the awareness of the system which is of vital importance to the people who not only work but also live immediately adjacent to these watercourses.

For safety reasons it is important for people to be aware of the nature and extent of hazards posed by the city's watercourses as they affect water-oriented activities. In the absence of adequate information, it is often not possible to recognize potential dangers.

Signs have been erected at a number of locations along the Elbow River warning of the dangers of unsupervised swimming and wading and indicating that the river has claimed a number of lives. A sign to this effect is also located on Prince's Island. Elsewhere, isolated signs exist at a number of locations along the Bow River. For example, in the winter months a sign is posted by the west channel of the Bowness lagoon indicating that the ice is often unsafe due to incoming water. Such signs have an obvious value. However, there are numerous hazardous locations where no signs exist, particularly on the Bow River. Obvious examples are deep and swiftly running reaches adjacent to areas used by fishermen or where a walkway/pathway exists. Also, downstream of the Bonnybrook Bridges there are a number of areas where the river is slow moving and people may be tempted to swim but the water is unsuitable for primary contact recreation due to effluent discharges from the sewage treatment plants.

Two main problems are associated with the provision of signs. Firstly, they are often aesthetically unpleasant and incompatible with the natural appearance of many riverside areas and secondly, they are obvious targets for vandalism. Neither problem can be completely resolved. Signs must be visually prominent or people do not see them and it is a practical impossibility to ensure that they are not vandalised; a few seconds with a spray can of paint is all a vandal requires. Furthermore, it would be difficult to identify appropriate hazardous areas and the signs may lead the public to believe that areas other than the identified parts of the river(s) are safe.

A more general public awareness of hazards can only be achieved through information and educational programs aimed at creating respect for the dangers associated with Calgary's watercourses. This can be achieved in a variety of ways in schools and through the various forms of media; advertisements, information brochures and newsletters can also be utilized. The Red Cross has an excellent series of posters relating to water safety and these can be given prominent exposure in public buildings, schools and other places where people, particularly the young, gather. It is important that any awareness programs undertaken be ongoing.

Currently, there is a lack of signposting along trails and at other facilities. There are a number of locations where users of the existing trail system can easily become disoriented, particularly where they are travelling some distance through unfamiliar parts of the river valleys. This is especially true where trails move away from the watercourse. As a result, many trail users lose the trail or inadvertently trespass on private property. All trails should be clearly marked, particularly where they intersect with other trail systems. The same applies to cross-country ski trails and specific facilities such as the potential canoe launching sites and interpretive centres.

The problem can be partially redressed by reducing the number of instances where trail systems are fragmented. However, there is clearly a need for signs in a number of locations, and where access is restricted the public should be advised accordingly. The availability of maps

would help significantly. These should be on a scale sufficient to permit accurate orientation and could indicate parks, natural areas, golf courses and other similar facilities. Such maps would go a long way towards enabling the public to plan their bicycle rides, day hikes, and other activities, and would simultaneously increase general public awareness of the existing system and the recreational opportunities present, thereby encouraging greater use. The maps need not be elaborate to be effective and may be made available for a nominal fee to cover the cost of production. A trail map presently exists for the Elbow River but is not very clear.

Attention should also be given to expedients that may provide a service to existing users of parks/trails and other open space facilities. A good example is the system of 'distance' markers provided by the Parks/Recreation Department on the Elbow River Trail. Such markers are of particular usefulness to joggers, cross-country skiers and cyclists who may wish to measure, or time, their progress.

E2 SOCIALLY UNACCEPTABLE BEHAVIOUR

E2.1 The Problem

The types of socially unacceptable behaviour most commonly reported in Calgary's parks and other public areas can be divided into three main areas of concern: vandalism, theft and other forms of related socially unacceptable behaviour.

Vandalism is wanton destruction. Examples of this are children throwing stones at waterfowl, the use of all-terrain vehicles in areas with environmentally sensitive natural vegetation and the damaging of public facilities, e.g. traffic and pedestrian signs, fences, picnic shelters and sheds, toilets, picnic tables and barbecue stands. Some damage is also inflicted upon private properties but this is not common.

In the spring of 1979, the Parks/Recreation Department, in response to a City Council motion adopted in August 1978, produced a document concerning vandalism in City parks (adopted by City Council in March, 1979) which itemized measures presently being taken to combat vandalism and made recommendations. The document, entitled "Vandalism in Parks", is included for public information as Appendix VIII. The approach adopted in that document is endorsed here. Consequently, whilst including vandalism, this chapter emphasizes other forms of socially unacceptable behaviour in accordance with expressed public concerns.

Theft includes the taking of park benches, picnic tables, firewood and the removal of wooden sidings from picnic areas.

Other types of socially unacceptable behaviour include drunken riotous parties, littering (particularly plastic and aluminum food wrappings and broken beer bottles), bullying, fast driving and revving of car engines, the playing of car radios, and molesting.

E2.2 Public Concerns:

Concerns regarding all forms of socially unacceptable behaviour were repeatedly raised by the public throughout the public participation program. These concerns are itemized in Appendices XVII and XVIII. The major concerns are outlined below.

Whilst socially unacceptable behaviour was clearly identified as an 'issue' at public meetings held in the fall/winter of 1978/1979 and at the Open Houses in May/June 1979, most of the detailed observations relating

to this concern arose out of riparian homeowner responses to the principle of continuous public riverbank access as shown on the preliminary concept plans at the Open Houses.

The potential for an increase in socially unacceptable behaviour was one of a number of concerns expressed by affected residents and, in the process of expanding on this line of argument, the nature and extent of problems associated with anti-social behaviour in adjacent public areas was itemized in some detail with numerous specific examples. The main concerns related to noise, drunkeness, foul language, theft, littering, molesting and vandalism (refer to Appendix XVII).

Only one question on the questionnaire distributed at the Open Houses included a reference to vandalism. Nine problems associated with City parks were listed and respondents were asked to rank these problems in order of importance. With an aggregate rating of 2.09, vandalism was perceived to be the major problem. Respondents volunteered a number of suggestions as to how to deal with the problem including lighting, severe penalties, minimum facility provision, no further extension of existing facilities, and encouraging local residents to quickly report problems.

E2.3 Socially Unacceptable Behaviour and Public Open Space

During the course of the public participation program, a few people expressed the opinion that further extensions of public open space in the river valleys were undesirable because of the seriousness of problems associated with socially unacceptable behaviour; poor management was also mentioned (refer to Appendix XVIII). This opinion was at variance with the expressed desires of most members of the public but because anti-social behaviour is generally perceived to be a serious problem, and because the opinion runs counter to the basic philosophy of this plan that lands adjacent to watercourses are ideally suited for public open space uses (Part B1 - Relationship to Objectives), it requires consideration.

Whilst it is accepted that locally the extension of public open space may have the potential to create problems and it may be possible to validly argue that these are undesirable in the absence of a clearly justifiable need for facility expansion, the general argument that expansions to the open space system due to potential problems such as vandalism must be rejected, particularly in the case of undeveloped lands, for the following reasons:

- Future Calgarians have a right to expect reasonable access to regional open space.

- City parks presently receive considerable use; as the city grows it is imperative to provide adequate additional open space in order that crowding and use conflicts in existing areas do not become unacceptable. Waterside areas are preferred locations.

- Present problems are associated with a very small percentage of the public users. It is unacceptable that the majority be seriously penalized due to the indiscretions of an inconsiderate minority.

- Anti-social problems are not restricted to areas of public open space. Lack of provision of open space can only displace the problem, not solve it. Urban areas with little open space provision traditionally have higher crime rates and increased problems with vandalism than is found elsewhere in urban areas with relatively more open space.

- Non-conforming behaviour is a characteristic of all societies and has been ever since man began to gather in socially organized groups. Use of this characteristic to justify exclusion of essential components of the urban infrastructure implies that acceptance that man's experiment with civilization is a failure. The nihilistic ramifications of this line of argument are clear.

E2.4 Litter and Pets

Concerns regarding two manifestations of socially unacceptable behaviour have been frequently expressed by the public. These are littering and, to a lesser extent, problems associated with pets.

Littering is a chronic problem in many public areas. It is a reflection of public attitudes and a symptom of the 'disposable' mentality evident in our society. The problem is particularly evident following periods of heavy public weekend use when many parks present an incredibly shabby appearance. Much of the litter in riverside parks is attributable to birds scavenging through the contents of waste disposal receptacles. They frequently create a horrendous mess. Magpies, gulls and crows are the main culprits. In the most intensively used portions of major parks, clean-ups by Parks/Recreation staff are usually very prompt. However, this is not the case in the peripheral portions of major parks and many of the smaller areas of public open space.

Litter strewn about by birds can be easily prevented by utilizing appropriately designed garbage receptacles. The 'people problem' is less easy to address. To give an analagous example, in the last few years society's attitudes towards smoking have changed drastically. This has resulted simply because non-smokers have increasingly refused to accept personal discomfort which was tolerated in the past. Similarly, as long as the public attitude towards littering is ambivalent, the problem will inevitably remain and authorities can seek redress only through City by-laws which are frequently difficult to enforce and may not change public attitudes. For many people, littering is effectively an automatic reflex. If offended members of the public are prepared to make their views known in a reasonable manner the littering party becomes aware of his actions, and whilst the information might be resented, it does provide food for thought. Enforcement is also important, being the joint responsibility of By-law Enforcement Officers and members of the public. The existing City Anti-Litter By-law No. 6486 is very comprehensive (Appendix IX).

A similar situation exists with pets, with concerns focusing almost exclusively on dogs. Dogs are found wherever man is. In an urban environment, their requirement for regular daily exercise can only be satisfied outdoors in public open spaces. Only the very smallest animals can be adequately exercised on a leash. Yet uncontrolled dogs running free in public areas create numerous problems, scaring people, fighting with other dogs and inevitably defecating in the most inappropriate locations. The cause of the problem lies solely with the owner. Very many owners are simply not responsible, either failing to satisfy the basic requirements of the animal or in doing so, showing little or no consideration for other people.

The section of the Parks By-law No. 36/76, Section 19 containing provisions pertaining to animals (Appendix X) and the existing City Animal Control By-law No. 96/77 (Appendix XI) are equitable, adequate and place the onus of responsibility for control of an animal clearly upon the owner. However, adequate enforcement can only be

achieved if concerned members of the public are prepared to become involved. This latter provision is the key. Officers of the Animal Control Division are always on hand to answer complaints and take whatever action is necessary in accordance with the provisions of the by-laws. The ultimate responsibility in ensuring effective response to a problem clearly lies with the public.

E2.5 General Discussion

Socially unacceptable behaviour is a manifestation of the wanton attitudes perceptible in society. The problem will not disappear without the strictest regulation and enforcement both of which are uneconomical and, in a free society, an unacceptable restriction on the rights of the well-behaved majority of users. Such restrictions that do exist are of dubious value. A good example is the prohibition of alcohol in parks. Studies have shown that individual and collective attitudes are the cause of the problem, the alcohol is the excuse to vent the emotions. By addressing symptoms rather than causes, this law is at best a stop gap measure. The restriction is largely unenforceable and is widely treated with contempt and resentment, which reinforces the 'us and them' mentality between the public and law making and law enforcing bodies. Yet, without the law, existing problems with alcohol use in public places might increase alarmingly. In terms of legislation, there are no 'right answers'.

In light of the above, it is considered that the following suggestions are practical, equitable and economical ways of combatting the problem.

a. Enforcement:

Regular police patrol at unpredictable intervals is an effective means of controlling anti-social behaviour. The major emphasis is prevention; a vandal is unlikely to act if there is a good chance of getting caught. A compromise must be reached between inadequate patrolling and omnipresent police patrolling. Patrol cars are of limited effectiveness in many parks where vehicular access is restricted. Existing by-laws should be enforced to the extent feasible.

b. Public Education and Assistance:

Public education is a long term measure aimed at changing destructive and inconsiderate attitudes. It can be carried out by the police in cooperation with schools, churches, community associations and other concerned community groups.

The general public have an interest and obligation in maintaining parks as attractive, safe and enjoyable recreational areas. Serious infringements by the anti-social minority should be reported and telephone booths should accordingly be conveniently located in or adjacent to parks. Common sense and discretion should be used.

c. Park Design:

Vandalism and theft can be discouraged by the effective design of parks and park facilities. Susceptible facilities should be rugged and kept to a minimum. To some extent this objective has already been achieved. Heavy barbecue stands are set in concrete and picnic tables are increasingly being chained down.

Design features of park layout can reduce the physical effects of socially unacceptable behaviour. To give a few examples, in intensively used parks, certain parts can be paved to withstand use and abuse by pedestrians, cyclists and motorists. Public motorized access to environmentally sensitive areas of a park can be prevented by the installation of barricades. Trails can be located away from environmentally sensitive areas e.g. waterfowl nesting sites.

Where night time rowdiness and vandalism are serious problems, locking public parks during nocturnal hours may be an effective deterrent. This was successfully done in Bowness Park. It should be noted that this expedient can only be successful where vehicular access to a public recreational area is from a single or restricted number of points.

By making misdemeanants and malefactors visible, the installation of night lights can also reduce the incidence of anti-social acts. Night lights are presently installed in many City parks. It should be noted, however, that such facilities often have an incongruous appearance in a park setting (except where provided for the express purpose of illuminating another facility such as an ice skating rink or football field) and may also have a deleterious effect on nocturnal wildlife and adjacent flora.